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ABSTRACT

This manual focuses upon natural resources issues and biophysical characteristics of the Everglades and adjacent southern Florida. Topics of the seven units of study are: animal life, ecosystems, geology, land use, plant life, recreation, and water management. Preceeding the activities in each unit is background information intended for both students and teachers. Also provided are student activity sheets, teacher guidelines, vocabulary lists, and sources of information. Values questionnaires, simulation games, school yard studies, and classroom discussions are among the types of activities included. (WB)

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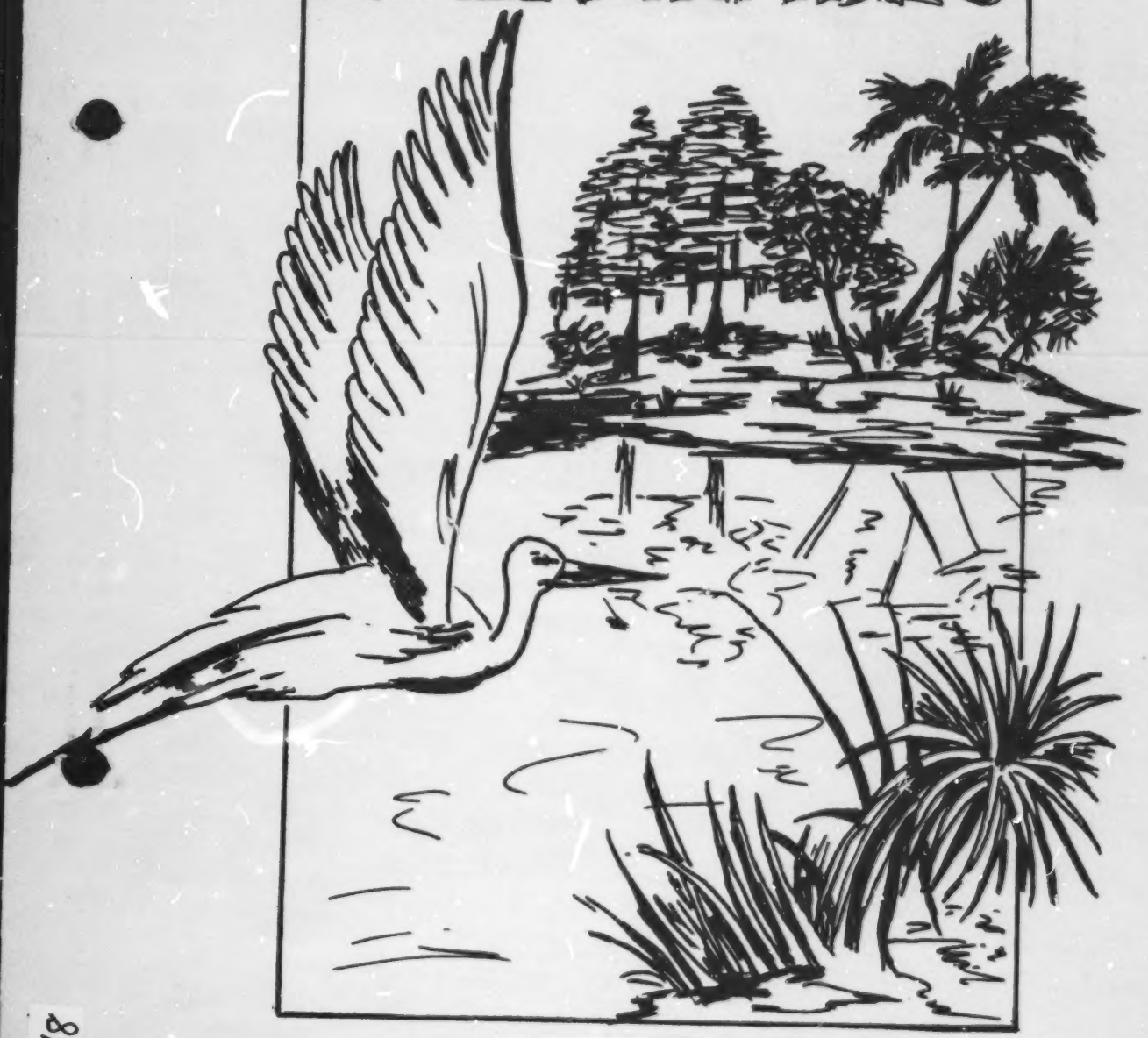
1976-77
Broward
Seminole

UNDERSTANDING the EVERGLADES



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INTRODUCTION

Great civilizations have thrived and died; not by ravaging wars but by inconsideration and waste of natural resources. To understand the vital involvement, review the history of such cultures as Mesopotania, China, Mexico and others ruined by man.

Man, the only living being on earth, with power to think and control his destination; to learn from historical records, still continues to destroy his eco-system.

This publication has been developed for all concerned citizens in order to understand those natural resources still available and the importance of protecting these priceless gifts for future generations and to the posterity of our culture.

We must remember the whispering of our past and keep awake to the signs of our own times.

The material which has been included may serve as a guide to the study of natural resource limitations, while keeping in mind future development in Broward County. The investigations are primarily concerned with the Everglades ecosystem; the treasured source of water for all people living in South Florida. It is designed for use in conjunction with the Markham Park Study Center.

The activities are planned for middle school level, however they may be adapted to fit [illegible] need.

This project was funded by an Environmental Education mini-grant from the Florida Office of Environmental Education.

Project Director
Leta Pelczar

Project writers
Carol Houck
Donna Fulcher

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Yesterday

"From This Wilderness"*

This land rich in history

Two hundred years ago,

A wilderness resistant to penetration.

A refuge for those oppressed

A land where only the rugged survived to build
the greatest nation in the world.

Carved from this wilderness, a dream fulfilled.

In the long, long ago, there was a tribe of Indians living in peaceful solitude in palm-thatched huts in the wild tropical jungle and dense pine forests. They had gone to rest after a long days hunt when they were rudely awakened by thundering noises and the ground beneath trembling as if the Great Spirit was truly angry. Even the most courageous feared to venture forth, until the sparkling sunlight of the new day showed a magnificent river flowing serenely before their huts.

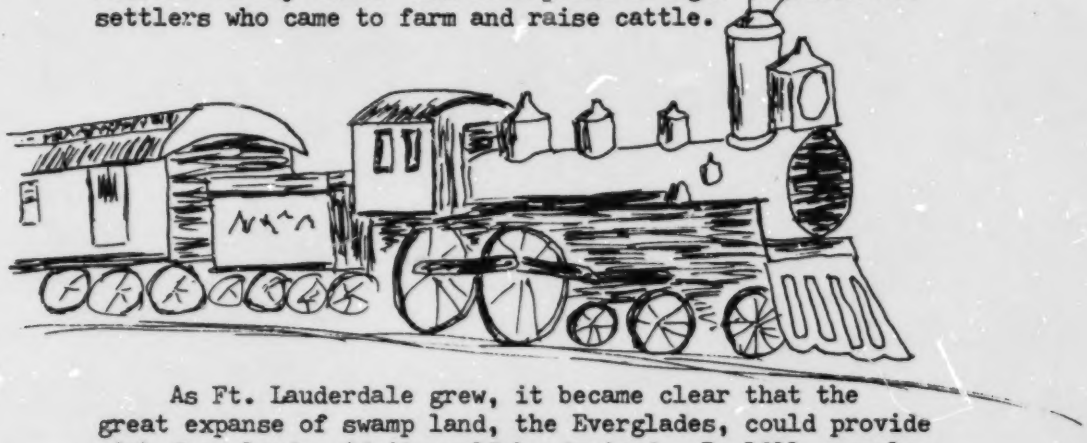
At the coming of the white man, the river Himmarshee, was called New River. Because it carried fresh water and was a reasonable avenue to the ocean, this river played an important part in the white settlement of Broward County.

Here the Everglades, stretching inland from the sea; vast, mysterious, impenetrable with tough trailing vines and tropical undergrowth was home only to the alligator, panther, bear, the chattering birds, the scattered Indians.

Following the white man's discovery of Florida, the area came under the control of five nations: France, Spain Great Britain, United States and the Confederacy.

Finally unable to defend her territory, Spain ceded Florida to the United States in 1821 for five million dollars. Early settlers were hardy people. They had to be. They not only braved the hazards of the tropical jungle but found, at times, the Indians were not too friendly. Their only communication with the outside world was an occasional ship and the Barefoot mailman who walked along the beach from Jupiter Inlet to Miami. The beach was the only direct route until 1892, when a shell rock road was cleared for the Bay Biscayne Stage line.

In 1883, Henry Flagler, a northern businessman, visited Florida and envisioned a railroad the length of Florida to Key West. His enterprise brought tourists and settlers who came to farm and raise cattle.



As Ft. Lauderdale grew, it became clear that the great expanse of swamp land, the Everglades, could provide rich farm land - if it could be drained. By 1911, canals were built from Lake Okeechobee to Ft. Lauderdale, the "Gateway to the Glades" under the leadership of Governor Napolean Bonaporte Broward. The same year Ft. Lauderdale was incorporated. Large land sale projects were touched off but the Everglades didn't drain. Finally local businessmen turned to tourism as a source of industry. By the end of World War I, hotels were ready for tourists. 1920 population for Broward County was 2000.

In spite of a short sharp depression, Henry Ford, with his $400 flivver and $5.00 a day minimum wage, Florida became the vacationland of America. Florida real estate was the thing to buy. Fraudulent land deals suckered many tourists into buying worthless property. Finally, the "paper house" boom collapsed. What borrowed money hadn't done, the 1926 hurricane finished, wiping out much of the boom time development.

The nation became involved in a second World War and the South Florida area experienced another growth period. People were attracted to the tropical living and Broward became one of the fastest growing counties in the nation. 1940 population: 39,794.

The few major streets that extended beyond downtown Ft. Lauderdale, were Broward Boulevard which stopped one mile east of U.S. 441, and U.S. 441, an isolated, narrow two-lane road connecting Dade and Palm Beach Counties. Clusters of Seminole chickees could be seen tucked into live oak forests along the way.

This land, rich in history,

Two hundred years ago a wilderness

Today, for many, a dream fulfilled.

The future, a new dream

*Exerpts taken from "From This Wilderness",
ITV Treasure Chest Series (Seminole Middle School Production)
6600 S.W. Nova Dr., Phone 765-6067

Acknowledgements:
Ft. Lauderdale Historical Society
Plantation Historical Society

LAND USE PLANNING

Unit Preview

All levels of government provide guidelines for projected development and use of the land, to insure future populations a compatible life.

STATE PLANNING

Today

Broward County has been growing in population rapidly in the last two decades. It's present population is ten times its 1950 level. To prevent random problem causing growth, citizens must not only be aware of its resource limitations, but should demonstrate their desires to their political representatives.

AREAS OF CONCERN ARE:

How many people can Broward County accomodate and still retain the high resident values it now offers?

What kind of life style will follow if the cost of energy and other essential commodities continue to rise?

Can a comprehensive resource program evolve to balance the many demands on land and water resources?

The Division of State Planning has developed the Green Plan* where interior plans, policies, and strategies are recommended to guide land use management.

Specifically, it provides information on Florida's Resources; their location; their significance; their vulnerability; management strategies to protect them; development practices to conserve them and identification of areas with few constraints to development.

Florida is beautiful and vulnerable. Development is inevitable and must be accommodated. Between 1970 and 1982, it is estimated that Florida's population will increase 33%. Nature will be replaced by growing islands of development, in time merging into a mass of indiscriminate sprawl.

The 1974 Legislature stated that, "It shall not be the states' policy to stimulate further growth, but to plan for and distribute such growth as may develop."

Unplanned growth would irrevocably destroy or seriously diminish the State's beaches, marshes, flood plains, aquifers, agricultural and forest lands and archaeological sites, recreation areas, mineral deposits and environmentally unique areas.

Land is abundant in Florida. Only 10% of the State is currently urbanized. Accessible, dependable, amendable land is available and it can be developed with minimum impact on the natural ecology.

The level of endangerment to Florida's resources was decided by studying the history of human activity and attitudes concerning the resource. The Division of State Planning assigned the resources to three levels of concern.

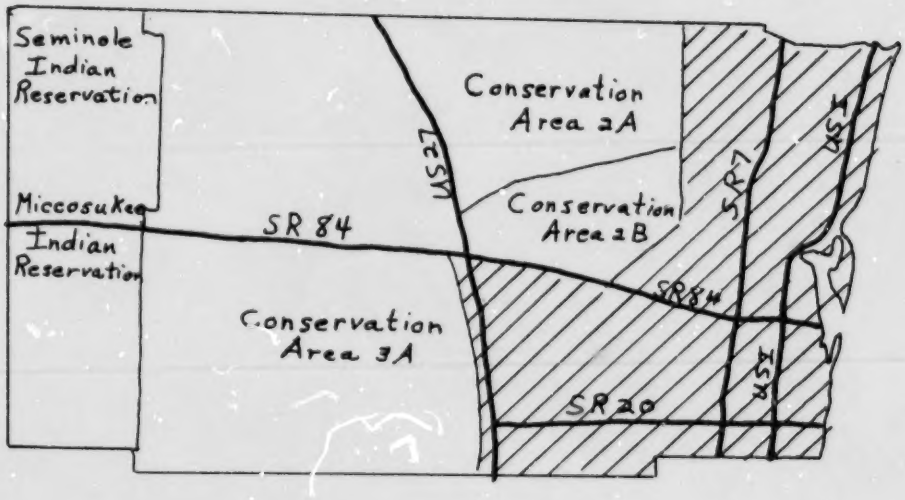
Priority I: water, coastal areas, and rare and unique natural resources.
Priority II: recreational resources, and forest resources
Priority III: historical and archaeological sites, mineral resources and public investments

Each of these resources will be discussed in this unit under their specific topics.

*"The Green Plan"
The Florida Department of Administration, Division of State Planning, Bureau of Comprehensive Planning;
Second Edition; June 1975

COUNTY PLANNING

TODAY



Broward County* has also provided a basic framework upon which efforts can be initiated to counter problems created by unplanned and unmanaged growth.

Areas of concern are: solid waste disposal; waste water; traffic; water quality; flood control; water sources and employment.

SOLID WASTE

At present Broward's total population of 867,000 persons can generate up to 800 more tons of solid waste daily than the County, cities, and local private firms can accommodate.

WASTE WATER

The Department of Environmental Regulation issues building permits for private "interim" waste water treatment plants because developers are building residential units faster than municipal services can handle them.

TRAFFIC

Traffic congestion caused by the increased volume indicates little relief over the next ten years with current projects for road construction.

FLOOD CONTROL

Large scale residential developments are being considered in the flood prone northwest and southwest Broward where densities are equal to or greater than those in flood protected areas yet the Central and Southern Florida Flood Control District and the V.S. Corps of Engineers have no further plans at this time to improve the primary drainage capabilities.

WATER QUALITY

The Biscayne Aquifer must serve three counties and yet wells are being permitted and dug and water is being extracted. Future projections of increased water consumption by homes and industry suggest that Broward County will in the future have to import water through lateral ground flow from the conservation area and surface flow from canals.

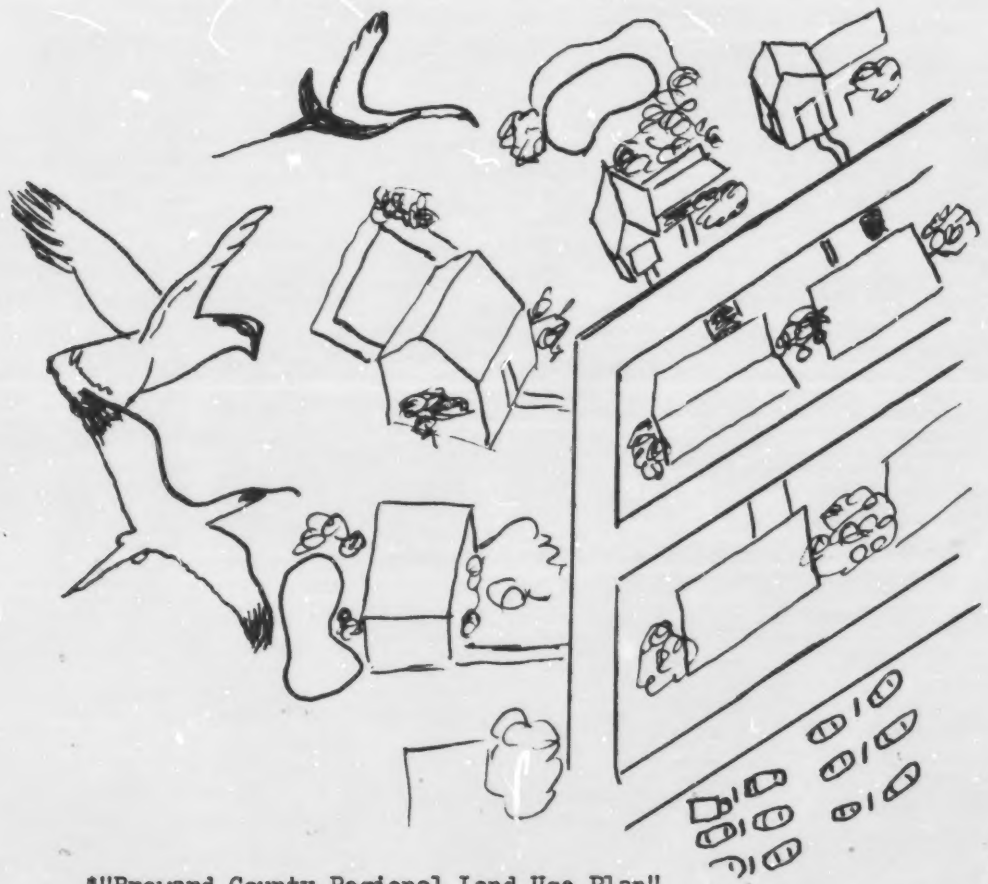
Water quality standards have been established by State and Federal authorities. Urban storm water runoff and effluent from sewer treatment plants continue to pollute local waters.

EMPLOYMENT

Present analysis by the Area Planning Board indicates Broward's leisure-oriented economy based on tourism, retirement, and the construction trade cannot adequately support a population much in excess of 1.25 million persons if the proportion of retiree households remains constant. Present developments have been primarily bedroom communities with little provision for employment base activities to balance growth of the labor force.

Individual municipalities also have devised Land Use Plans and although they may be unique, each area is interdependent upon surrounding areas and must comply with County and State plans to insure the welfare of all.

As indicated, planners must be aware of the uniqueness of the area, as well as knowledge of the citizen's needs within those boundaries. When all facets are considered, the whole picture can become very complex.



*"Broward County Regional Land Use Plan"
prepared by Broward County Area Planning Board, June 1974
and November, 1976
1600 S.E. 10 Terrace, Ft. Lauderdale, Fla. 33316

TEACHER GUIDELINES

For best understanding of the situation, it is suggested that each community should become familiar with their own city's land use plan. Contact your local city council or planning and zoning board for further details.

Areas of concerns will be found under specific titles in the following units, although the reader will find that no system can be entirely separate from another. Each will depend upon others as is explained under "What is an Ecosystem".

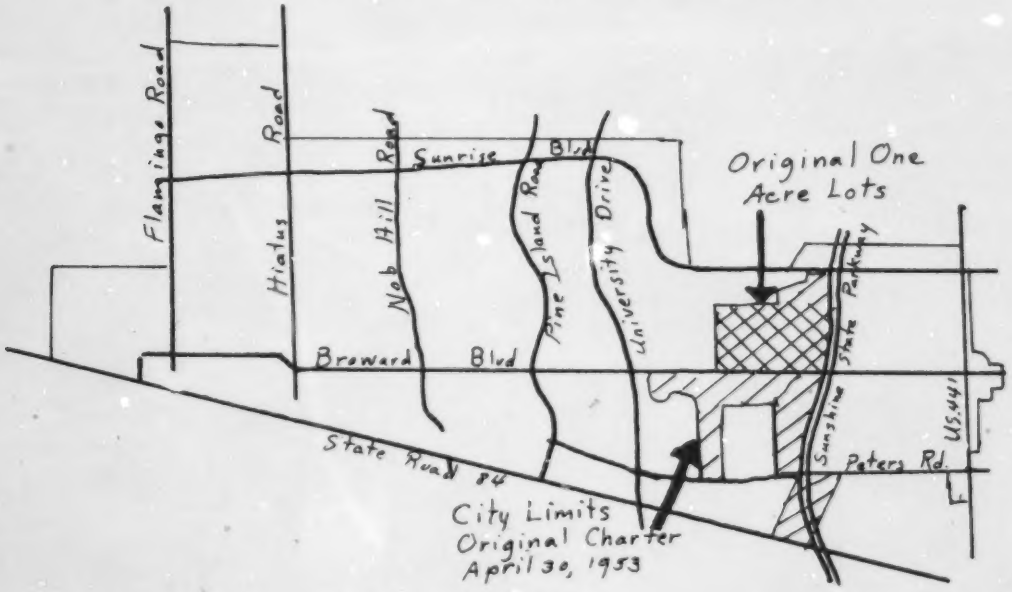
Pages 12 - 15 contains information about Plantation which may serve as a guide for information about other communities.

CITY OF PLANTATION, FLORIDA

The Land Use Master Plan for Plantation,* Fla., is a result of much citizen input but it is not a detailed blueprint for future development. It is a guide for Broward County Planning Council for making decisions, related to coordinating the development of other municipalities. Revision is essential and the Plan can be changed for justifiable reasons.

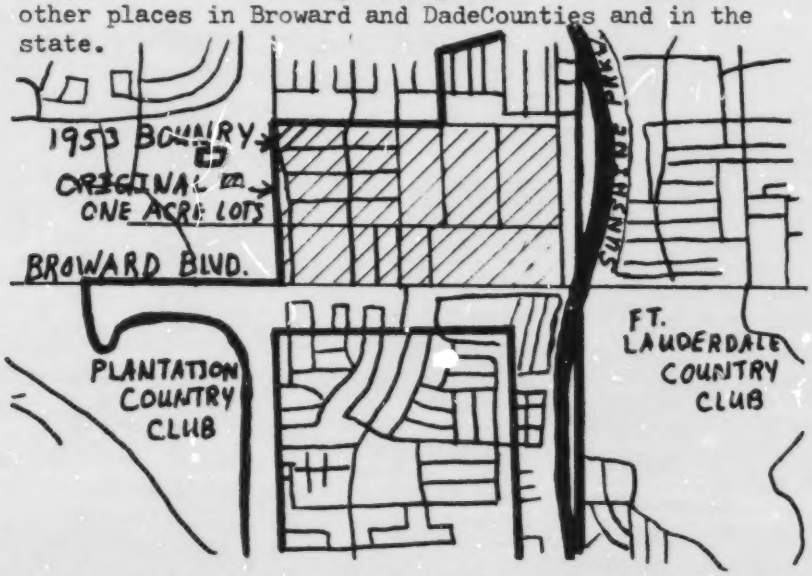
In 1945, at the end of World War II, Mr. Fred T. Peters had 15½ square miles of reclaimed land where he raised cattle and horses. In 1947, he commissioned Russell T. Pancoast to plan a unique, well-ordered, attractive community. The city grew rapidly, and on April 30, 1953, a charter was granted by the State Legislators, establishing the City of Plantation. Since that time, expansion continued until 1974; there was a total of 22 square miles, rezoned by Gulfstream Land and Development Corporation, under the direction of Irving Wasserman, ASLA.

In spite of rapid growth, the original plan prepared by Mr. Pancoast, proved to need little revision and has served the city remarkably well.



*Land Use Master Plan 1975
City of Plantation, Fla.
City Planner, H. Samuel Kruse, FAIA, AIP

Plantation has developed from a semi-agricultural community of 500 to 32,500 people, who represent a white collar community. As reflected by the 1970 U.S. Census data, the median age is 34, median education; 12.8 years and median family income is $14,855. Many heads of household are professionals, managers, proprietors or self-employed persons who commute to other places in Broward and DadeCounties and in the state.



Plantation lies in the center of west-central Broward County, with the north-south University Drive and the east-west Broward Boulevard passing through its center, providing links with Dade and Palm Beach Counties and Ft. Lauderdale.

Property values have increased tremendously from $3,335 per acre in 1960 to $42,500 in 1970.

Costs for operating the City's government were paid from revenues from cigarettes, utilities, franchise; from building permits and service fees. Ad valorem taxes were started in 1974 to pay for expanded police, fire, recreation and other governmental services.

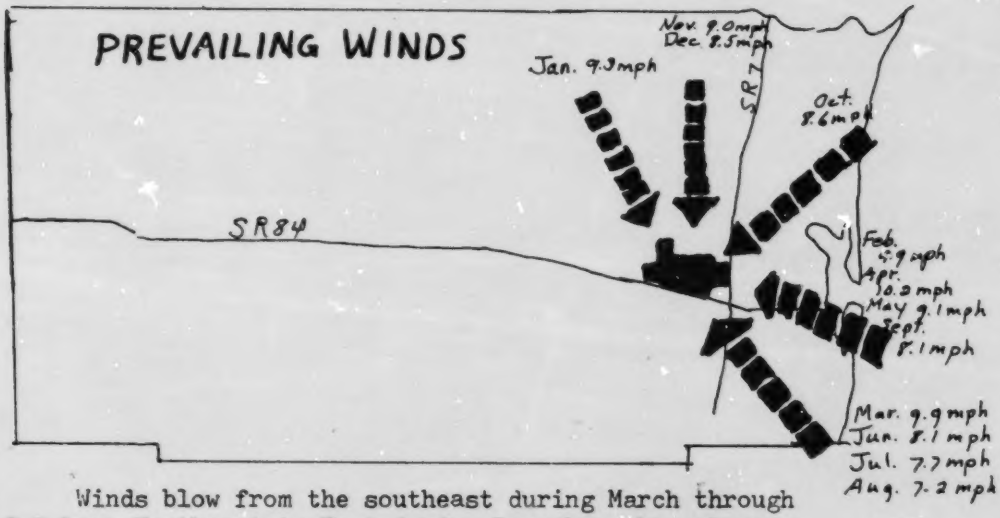
The developers of Plantation have provided streets, water and sewer extensions, parks, schools and other community facilities as well as establishing compatible industries.

The predominant commercial operations are of retail (218) or service nature (120) with a large percentage of professional (211) offices.

There are three major shopping centers, one community center and four neighborhood centers with a regional shopping center at Broward and University Drive now being built.

PHYSIOGRAPHIC ANALSIS

Plantation lies between the coastal zone of swampy grassland just east of the conservation areas and shares the geological characteristics of this region. Plantation lies approximately in the middle of a gentle slope covered by a thin layer of muck topsoil underlaid with sand.



Winds blow from the southeast during March through October, Northwest to East during December through February. General elevation generally fall between 4 to 5 feet above sea level.

All development requires the use of fill material for foundation and flood protection.

Plantation lies above the Biscayne Aquifer; the principal source for potable water: The quality is generally good. General elevation generally falls between 4 to 5 feet above mean seal level.

BIOLOGY

Plantation, today, represents a disturbed area or plants of secondary succession. Native trees and shrubs are recommended for landscaping rather than exotics, such as melalcuca, Australian pine, and Brazillian pepper (Florida holly) which have become a nuisance, in that they grow profusely and are difficult to kill and have taken over natural areas. Evidence of this is clear in tree islands of the Everglades particularly along Route 27, south of Andytown. (See unit on exotics)

Aquatic life is meager. Birds that remain in spite of development are Eastern Mockingbird, Boat-tailed Grackle, English Sparrow; Mourning Dove; Purple Grackle; Smooth-billed Ani. Night Hawk, Cardinal, Rufous-sided Townee, Florida Gallinule and Mallard Duck.

Armadillos, wood rats and mice, cotton tail rabbits, and racoons can be found in wooded areas.

THE FUTURE

Broward County Planning Council recommends 10 acres per 1000 population, including parks and open spaces. Today 55% of Plantation is zoned for residential; 6.7% Commercial; 27%, Rights-of-way; Public and semi-public parks and open spaces, 11.3%.

To insure a good life for future generations, planning for development is necessary for retainment of natural areas. "It's not that we inherit the land from our fathers but rather that we borrow it from our children"

Using current criteria for proposed facilities and services, the projected population of Plantation of 140,000 by the year 2000. The area of Plantation is 13,971 acres; therefore projected densities are 3.7 dwellings per acre. All indications are that the projected population can be supported without ecological or environmental impact.

TEACHER GUIDELINES
for
STUDENT ACTIVITY
VALUES

"What do I Value" questionaire should provide the student with an internal analysis and insight regarding the option to live in an area having planned open space versus one with unregulated development.

The questionaire is followed by suggested observations to be made and recorded over at least a one week period in the students' own community. Upon completion, these observations should provide areas of concern to be discussed, debated or researched.

Sample questions:

1. Should additional projects be permitted despite evident inability of Broward County facilities to handle even present solid waste disposal?

2. Should growth be permitted to outpace the ability of the County to provide adequate waste water treatment?

3. Should large scale high density developments be permitted which will generate traffic onto roads already over capacity levels?

4. Should residential growth be permitted without a corresponding balance of employment opportunities?

5. Should water be pumped without restriction from the Biscayne Aquifer?

Student Activity

WHAT DO I VALUE?

This is a questionnaire, not a test. There are no right or wrong answers. The purpose of this questionnaire is to determine how you feel about parts of your world.

I. Blacken in the box following the thing you would do if you had to choose only one.

1.	Go on a canoe trip (a)	or a car rally (b)
2.	Have a house in the country (a)	or in the city (b)
3.	Drive a Corvette (a)	or a Chevrolet Vega economy car) (b)
4.	Have 4 children (a)	or 2 children (b)
5.	Visit Everglades National Park (a)	or downtown Ft.Lauderdale (b)
6.	Buy a home with a pool (a)	or a home with trees (b)
7.	Own an electric can opener (a)	or a manually operated one (b)
8.	Plant a garden (a)	or build a patio (b)
9.	Become an engineer (a)	or a biologist (b)
10.	Improve the world (a)	or become very rich (b)

II. Assume that each of the following proposals is being voted on in your community. Vote YES or NO on each one.

		YES	NO
1.	A law to require markets to sell only returnable bottles with a 10¢ deposit per bottle.		
2.	A law prohibiting the use of trail bikes or other motorized vehicles on park trails.		
3.	A law limiting the number of cars a family may have.		
4.	A law limiting the number of people who may live on an acre of land (population density).		
5.	A law limiting the number of people who can enter a local park on any one day (because of crowded conditions).		

6. A law to make it illegal to cut down a tree with a trunk 4" or more in diameter, even on one's own property, without a special permit.

7. A law to preserve an area of your community which scientists say is important to the ecology; part of the law will force some people to sell their property.

8. A law to make free medical information on birth control, family planning and abortion available.

9. A law to stop all spraying for mosquitoes.

10. A law making it illegal to sell or use phosphate detergents.

III. Read each situation. Then select the best solution from those offered. If you believe none of the choices is good, please describe your solution in the space provided.

1. The town where you live has just suffered a major power blackout. You were without electricity for 48 hours. In order to avoid this problem in the future, the power company wants to build a new atomic power plant along the river. Scientists say that the heat and wastes from the plant would pollute and destroy much of the river's plant and animal life and would damage the beauty, the recreational uses, and the ecology of the community.
What do you think should be done?

   (a) Build the new power plant as fast as possible.
   (b) Limit the amount of electric power allowable during peak use times.
   (c) Raise the price of electricity for large users.

(d) Build the new plant, and ask the power company to do everything possible to avoid pollution.

(e) _____

_____

2. Scientists say the river in your community has become polluted from the pesticides (insect and pest poisons) used in yards, on golf courses, etc. The rains, they say, wash much of this poison into the canals, which carry them to the river, and finally to the ocean, where now the oyster and fish industries are in danger.

What do you think should be done?

(a) Ask people to use less pesticides.
(b) Prohibit the sale and use of pesticides in the community.
(c) Make it necessary to get a prescription from a local agricultural agent to buy pesticides, and then in only the amount needed for a pest problem.
(d) Take no action. Probably the scientists are exaggerating, and people need to spray their lawns and gardens. To limit the use of these products is taking away people's constitutional rights.
(e) _____

_____

LAND USE
STUDENT REACTION

As you travel in your community or surrounding areas, look at age and condition of businesses, houses and buildings. Where do you see the most litter, traffic, people, trees? Answer the following questions.

1. What did your community look like 50 years ago? 20 years ago? 10 years ago?

2. What are the four major types of transportation that have shaped the development of Broward County? What order have they followed historically?

3. Go to your nearest major shopping center. Name different types of businesses.

4. What type of transportation is most common there?

5. Can you name two ways you might improve the traffic movement on major streets in your community?

6. Do you have large apartment and condiminium housing developments in your community? Were these buildings here 20 years ago?

7. In your opinion, why are these apartments and condominiums being built in this area?

8. Go to the Hollywood-Ft. Lauderdale airport. Much of the land around the airport has been zoned commercial and industrial. Give two businesses that are located in this area and do they require transportation services (if so, what kind?)

9. Give two reasons the county either <u>should</u> or <u>should not</u> expand the present airport.

10. Look at the private planes parked on the airport. Do you think the numbers of private planes are increasing or decreasing?

11. What do you think will happen when this number reaches a maximum for this airport?

12. Going West on Broward Boulevard, State Road 84 or Hollywood Boulevard, what types of businesses do you see?

13. Do you think the city is moving West?

14. Do you see any farmlands, grazing pastures, orange groves being developed? Give reasons for their disappearance.

15. In your opinion, what will happen to these fields in the next 10-15 years?

16. Will land values go up or down in this area? Why?

17. In how many canals, can you find good fishing in your community?

18. In your opinion, who is contributing more to environmental pollution? Why?

19. What changes do you find in downtown Hollywood or Ft. Lauderdale?

20. What role did New River play in the early development of Broward County?

21. What role does New River play today?

22. What provision has been made for solid waste and waste water disposal in your community?

23. What is the source of water (pumping stations) in your area?

24. How many parks or recreational areas are there in your community?

25. What governmental bodys control development in Broward County?

26. Who are your governmental representatives at <u>all levels</u>? Do you know their stand?

27. If you wished to make changes in your community, how would you voice your opinion?

After you have completed your observations, list situations or areas where you feel improvements could be made. Consider litter, traffic, noise, buildings, people and open spaces.

VOCABULARY
LAND USE

Amenable land - land which may yield or submit to development or remain natural
Aquifer - an underground water storage

Conservation area - governmentally controlled; land not permitted to be developed
Criteria - a standard of judgement

Environmentally unique - an ecosystem which contributes a special quality to living things involved
Land Use Planning - guide to how land may be used to keep a balanced ecosystem
Pesticide - a chemical substance for destroying insects

Pollute - to make foul or dirty

Priority - that which has the greatest importance

Prohibit - to forbid or to prevent

White collar community - people who are mostly specialists, proprietors, managers; versus trades, construction or services

SOURCES OF INFORMATION
(Regarding Land Use Planning and Controls)

Call: Broward County Commission 765-5121
League of Women Voters 771-0715

Write to: Any one of the seven County Commissioners at
Room 248, Broward Court House
Ft. Lauderdale, Fla., 33301

Ask for: Broward County Commission Annual Report
Broward County Government

REFERENCES VALUABLE TO DISCUSSION AND RESEARCH:

Broward County Land Use Plan 1977
Broward County Commission

Central and South Florida Flood Control District
Florida Department of Natural Resources

"Pesticide Do's and Don'ts"
National Audubon Society
950 Third Ave.
New York, N.Y., 10022

Recreational Development of The Everglades Water Conservation Areas of Florida
Florida Game and Fresh Water Commission

Environmental Quality by Design, South Florida;
Albert R. Verie, William W. Jenna, Jr., Dorothy Eden Bergamaschi
University of Miami, Coral Gables, Fla., 33124 ($25.00)

The Green Plan
Information Systems Section, Florida Division of Planning
Department of Administration

The South Florida Study
South Florida: Seeking a Balance of Man and Nature
Florida Department of Administration

Local Planning and Zoning Board or City Council

WHAT IS AN ECOSYSTEM?

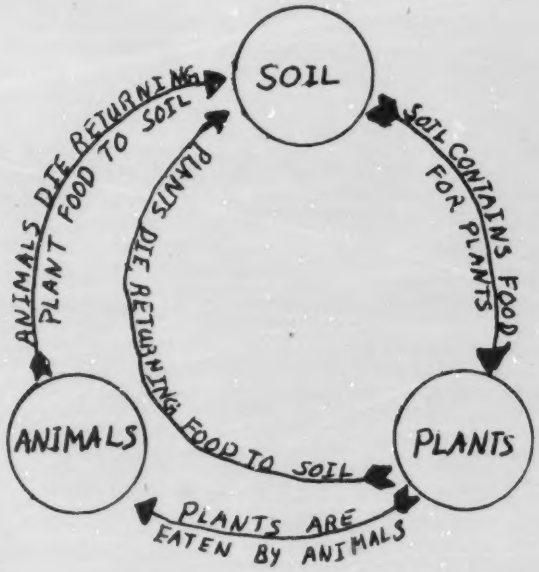
Unit Preview

It is important to understand that no one system is independent. Animals depend upon the type of plants which support them for food or cover. Plants, in turn, depend upon the geological formation, weather conditions and availability of water.

Living and non-living things are moving in a constant cycle. It is difficult to define boundaries for specific systems. The Everglades is a broad, general classification with many sub-systems. The general concern here, is the saw-grass marsh community.

Included are several good references for the study of the ecosystem.

GEOBIOTIC INTERRELATIONSHIPS



The intricate and intimate relationships between soil, plants and animals.

ECOSYSTEMS OF THE EVERGLADES

The Sandy Scrub

Sandy scrub habitats may be found in the inland areas of Florida that were once covered by the sea. Sometimes these sandy flatlands are very near the coast. Here the Australian pine, or casuarina establishes itself and the rosary pea vine twines around bushes and trees. Further inland these sandy areas are "home" for many varieties of pines, huckleberry, and saw palmetto.

The Hammocks (Tree Island)

The many hammock habitats of South Florida contain soil that has been enriched by decayed vegetation. Some hammocks are merely bits of high land located near swamps, or they may appear as small "islands" in the open grasslands. The strangler fig often finds its "host" tree in the hammock. Bromeliads grow in vast numbers and kinds in the cool "protection" of the hammock. Other hammock trees are the gumbo-limbo, mahogany, bay cedar and poisonwood. Lichens may be found in any hammock

The Fresh Water Swamp

This low, watery habitat supports a variety of plant forms. Many kinds of bromeliads flourish in the cool dampness provided by the heavy cover of cypress and sabal palm trees. Ferns, mosses and lichens find the perfect home in the quiet cool of the fresh water swamp, also wild orchids.

SAWGRASS MARSH

The large sedge sawgrass communities constitute approximately 65 to 70 percent of the total vegetation cover in the Everglades. In some areas, it occurs in almost pure, dense stands with individual plants sometimes exceeding ten feet in height. It is well named because of its barbed, three planed cutting edge.

Woody vegetation is interspersed throughout the area on sights slightly elevated above the surrounding marsh.

TEACHER GUIDELINES

for

STUDENT ACTIVITY

ECOSYSTEM

Encourage students to consider the smallest area as an ecosystem. Wherever they can find plant life, something consuming it and decomposing it, there is an ecosystem. The following questionnaire will aid in understanding that an ecosystem does not necessarily have to be extremely large.

Take a walk around your school and identify small ecosystems.

A simulation game may help students to understand the complex and interwoven aspects of their own community ecosystems.

There are several good textbooks covering the ecosystem concept. Refer to "Sources of Information" for recommended studies and activities including a quadrant analysis.

STUDENT ACTIVITY

An ecosystem is any self-renewing community populated by producers, consumers, and decomposers. This constant cycling of matter has allowed life to remain on earth for millions of years. Listed below are various things with which we are all familiar. Put a check beside any of these you believe to be an ecosystem.

( ) your body	( ) your house
( ) the world	( ) your backyard
( ) a dog	( ) a tree
( ) a bare rock	( ) your classroom
( ) the moon	( ) a concrete parking lot

Now find out if you really understand what an ecosystem is.

1. Your body IS NOT an ecosystem because it is not a producer. It cannot make its own food but must get its energy from other organisms.

2. The world IS an ecosystem for it has producers, consumers, and decomposers all working together to recycle the matter on earth.

3. A dog IS NOT an ecosystem. It is a consumer like you.

4. A bare rock IS NOT an ecosystem for it is only non-living matter and does not contain life. An ecosystem must contain life.

5. The moon IS NOT an ecosystem for it does not contain life.

6. Your house IS NOT an ecosystem. It does not cycle matter.

7. Your backyard IS an ecosystem, for in it you will find producers, consumers, and decomposers and a cycling of matter. Ex: grass, insects, and bacteria decomposers.

8. The classroom IS NOT an ecosystem. It may contain life (plants and animals) but it does not cycle this matter. It is dependent upon many outside things.

STUDENT ACTIVITY

9. A concrete parking lot IS NOT an ecosystem for the same reason a rock is not. It does not contain life.

10. A tree IS an ecosystem and now you are ready to study a tree ecosystem. The tree in itself, along with plants on it, is the producer. There are both consumers and decomposers of those consumers on the tree. Thus there is a cycling matter.

HABITATS:

A habitat is that particular place where plants and animals have exactly the right climate, soil, temperature, protection, and food supply to live, grow, and reproduce. There are a number of different habitats in south Florida. You will find various plants in these various habitats.

STUDENT ACTIVITY

1. Describe a hammock. How is a hammock formed?

2. There are three major areas of vegetation in South Florida: the sawgrass swamp; Cypress swamp; and the mangrove swamp. How does the sawgrass swamp rate as a productive vegetative region?

3. What causes destroy vegetation and return an area to barren land?

4. Describe the succession of plant growth; from barren land to "peak" growth.

5. How does the growth of a maple tree effect other vegetation?

6. Define "eutrophication".

7. How does man effect the natural eutrophication of fresh water marshes or canals?

Student Activities

1. Walk through the woods and find several types of logs; a newly fallen tree, a tree in the process of being decayed (habitat for a number of plants and animals), and a log almost fully decayed (mostly earth). Sketch each of these logs on your sketch pad.

2. Examine the log which is in the process of being decayed. Try to disturb the plants and animals as little as possible. If possible, wear garden gloves and be careful not to let the little critters bite you as some bites might be harmful. Answer the following questions.

   a. Approximately how long is your log?

   b. How do you suppose the tree died (destroyed by man, lightning, wind, disease, old age, etc.)

   c. How did you come to that conclusion?

   d. What texture is the bark? what color?

   e. If you can find a leaf that probably came from your tree draw it.

   f. Do you have any idea what kind it was? If so, what?

3. What is a HABITAT?

4. Give one example of two living things you saw interrelating.

5. Did you see any DECOMPOSERS?

6. Was the COMMUNITY larger on the tree which was newly fallen, the tree in the process of being decayed, or the tree almost fully decayed?

7. Lichens are scaly growths on trees. They can be of many colors but the most common lichens are greenish-gray. Do you think you saw lichens on your log?

8. Did you see any fungi? If so, what color or colors were they?

9. Man often burns trees and other plants when he clears areas. After studying the rotten log you should know that this is not a wise practice. Explain why.

STUDENT ACTIVITY
WORDS YOU NEED TO KNOW:

Match the following vocabulary words with the definitions.

1. Environment	_____ Particular place where plants and animals have exactly right climate, soil, temperature, protection, and food supply to live, grow and reproduce.
2. Food chain	_____ Organisms that get their energy by eating other organisms.
3. Decomposers	_____ The sum total of all living and non-living things.
4. Consumers	_____ All living things.
5. Food web	_____ Any self-renewing community populated by producers, consumers, and decomposers.
6. Organisms	_____ System by which all organisms get energy through various sources of food.
7. Interrelationships	_____ The transfer of energy from sun to plant to consumer to other consumers to decomposers.(decayers)
8. Ecology	_____ Study of interrelationships of all living things.
9. Producers	_____ System by which all organisms get energy through food diagramed in simple fashion with only one type of food.
10. Energy cycle	_____ Organisms that decay other organisms.
11. Ecosystem	_____ Organisms that take energy from the sun and make food.
12. Habitat	_____ Acting upon one another.
13. Cambium	_____ Tree "islands" located on slightly higher ground than most of the land areas surrounding them.
14. Palmate	_____ Living things interacting with one another in a given environment.
15. Pinnate	_____ A layer of soft cellular tissue between the bark and wood in plants, from which new bark and new wood originate.
16. Hammock	_____ A leaf shaped like an open palm of the hand, veins branch directly from the tip of the petiole
17. Community	_____ A leaf resembling a feather, smaller veins branching directly from the midrib.

TEACHER GUIDELINES

SIMULATION GAMES

Simulation combines elements of simulations, game and role-playing, where students assume the role of decision-makers and compete according to specified rules.

After the game is completed, ask what kind of additional data you would have liked to have had for your group, e.g., topography, vegetation, economy, climate, historical information, existing zoning, political climate, and population.

Emphasize the need for a variety of information and data before we can intelligently make a land management or environmental decision to best meet the needs of the most people.

You may wish to develop your own simulation game See guidelines for developing your own simulation games, or use a commercial game, such as, "Gomston"; #ID-3055 Ideal School Supply Co., Oak Lawn, Ill, 60453. Price $25.00

GUIDELINES FOR DEVELOPING YOUR OWN SIMULATION GAMES?

I. Develop a set of procedures to be followed in playing the game.

   A. Goals and/or objectives
   B. Rules for playing the game
      1. voting procedures
      2. process for recording data
      3. time limits
      4. procedures for presenting data
   C. Responsibilities of the players
   D. Provisions for students to collect data, where obtainable, how best to obtain data.

II. Select a particular land area in your community (examples below)

   A. A vacant lot
   B. An older building - possibly condemned
   C. A small park

III. Establish a land use problem involving the selected area. (example below)

   A. An apartment building is being proposed for a large vacant lot that is used for a sand lot ball field.
   B. A service station is being proposed on a corner across the street from your school.
   C. A low cost housing area is being proposed on some land next to some more expensive homes.
   D. A small shopping area is proposed next to a residential area.

   * The land use problem might be developed from a newspaper article from your local newspaper.

IV. Establish the groups which will have a vested interest in the development of the selected land area.

   A. Residents who own homes near the property, planning commission, apartment building owners, construction workers, store owners near the area, children who play on the lot.

B. Oil company representative, residents, construction workers, parents of school children, school official, city planning commission.
C. Residents from the more expensive homes, construction workers, contractor, prospective residents of low cost housing, church groups, planning commission.
D. Residents, store owners, contractor, land developer, city planning commission.

V. Identify the possible effect this change will have on the community.

A. What effect on taxes for this land and surrounding land.
B. What effect on land values of the area.
C. What effect on traffic density and pattern.
D. What effect on population density and make-up.
E. What effect on schools, playgrounds, churches, stores of the area.
F. What effect on wildlife, and other natural environment land, water, air.
G. What effect on utilities - such as garbage, sewage, electricity.

VI. Some possible ways of developing the game

A. Teacher developed - teacher plans and develops the entire game with objectives, information sheets, maps, role identification and information, playing pieces, cards for information and to present the guidelines and rules.
B. Teachers and students develop the game with students helping to identify the problem, establishing the vested interest groups, finding out cause and effect, costs, and change. (Suggest using a prepared game or two before trying this procedure.)
C. Teacher prepares some task cards to present a situation with some information and the group would develop the rest of the game from the task card. The task card should be clear and concise, but furnish only the general information. The students would develop the specific details.

Agencies which might be consulted for further information:

1. City Council
2. City or County Planning Commission
3. Chamber of Commerce
4. County Tax Assessor

Other resource people according to your area.

1. local realtor
2. local businessman
3. apartment house owner
4. contractor
5. resident

These guidelines written by Nelson Smith and Henry Gilmore, Milwaukie, Oreg., school teachers.

SIMULATED LAND USE GAME*
(Teacher Instructions)

1. Distribute background information for Centerplace City.

2. The problem to be decided is what are some possible uses for the one-square mile (640 acres) of county farm land, four miles northeast of the city. It is now available for the city's use.

Question: "What are some possible uses for the undeveloped land? (As students respond, write all comments on board. Number the items as you go along and refer to them later by number.) (When you get 15 or 20 items, STOP.)

3. "Which of these uses are similar?" (Designate similar uses by letters --A by all of one group, B, the next, etc.)

4. "What label could we give to all the items in A?" e.g. Recreation, Industrial, Utilities, Housing, Commercial.

5. Divide the class into the number of categories (keep groups to 6 - 10) and assign each group to a category.

6. ALLOW 10 MINUTES to list and analyze possible uses for the vacant land in your assigned category.

7. ALLOW 20 MINUTES to plan a strategy and develop a 3 MINUTE presentation to the County Board of Control. (This must include a PROPOSAL, VISUAL DISPLAY (maps) (advantages of your plan) and benefit for the greatest number of people)

7.a) ALLOW 10 MINUTES of the above strategy. STOP the group and say that the current County Board of Control has quit due to environmental impact workload and give each group ONE MINUTE to elect one member to represent them on the Board. Take the Board into another room and tell them they will be responsible to hear the presentations and decide upon the best one. Their job in the next 10 MINUTES is to: consider no rebuttals from the group; limited questions from the board. The BOARD OF CONTROL is to select a chairman who will chair the board meeting; develop the criteria to be used in evaluating the proposals based on the needs of the people and the characteristics of the land. Also develop some kind of chart that you can use to evaluate the presentations.

8. Remind the groups they have eight minutes to coordinate their presentation.

9. Board of Control enters and sits at front of room. Appoint a timekeeper to keep all presentations to THREE MINUTES (give two-minute warning). Allow 5-10 minutes for board questions or rebuttal. Keep limited)

10. Board is allowed 5-10 minutes to select the best proposal. <u>They must give their reasons</u>: give their criteria for judgement.

*The Centerplace City problem has been adopted with permission from the May 1970 Journal of Geography from the article "A Land Use Alternatives Model for Upper Elementary Environmental Education" by Dennis Asmussen and Richard Cole, University of Washington

STUDENT ACTIVITY

WORK BY YOURSELF. (10 Minutes)

Read the background information for Centerplace City, and then list some possible uses of the vacant farmland.

> "One square mile of unused county farmland, four miles northeast of the city is now available for the city's use."

Background Information Sheet: Centerplace City

The population is 250,000 and rapidly increasing. The city's boundaries are being extended, but the surburban fringe is expanding even more rapidly.

The rapid population growth is accompanied by demands for more housing, more jobs, additional city services, and recreational areas.

The power for industrial uses, adequate public transportation, and a skilled labor force are available.

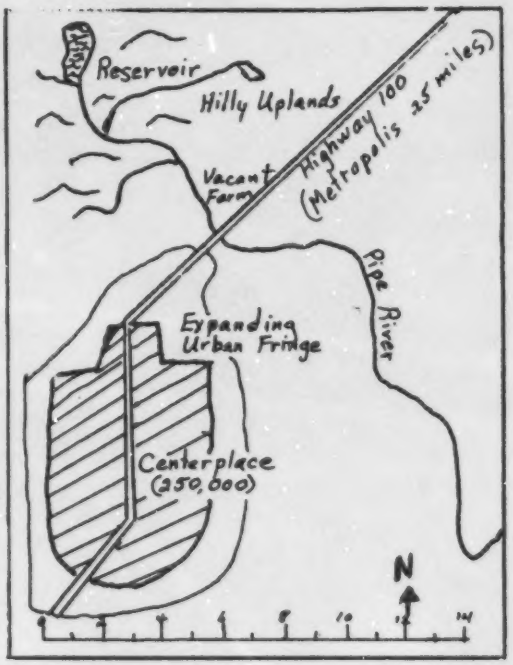
The city is located near forests, which are to the north.

The land to the east is devoted mainly to farming.

The Pipe River is unpolluted and is the source of irrigation water as well as the municipal water supply.

The river is too small for freight transportation, but logs could be floated on it.

The gravel bed of the river is appropriate raw material for concrete manufacture.



The present sewage treatment plant and garbage disposal area are at maximum capacity. The citizens of Centerplace are concerned about the maintenance of a scenic regional environment.

The County Board of Control is the authority for land zoning, and many citizens' groups are developing to influence zoning decisions.

List possible uses of the land.

VOCABULARY

ECOSYSTEM

Cycle - a complete series of events which reoccur within a period of time

Ecosystem - inter-related parts of the living - non-living cycle; dependent upon each other for continuity

Eutrophication - water containing an excess of nutrients, supporting uncontrolled growth of organisms which use quantities of oxygen

Hammock - slightly elevated area permitting woody growth in a marsh land

Succession - sequence of vegetative or animal growth, from barren land to peak development

SOURCES OF INFORMATION

ECOSYSTEM

Broward County, Fla. IEE Project, Book 2
"Introduction to an Ecosystem, A Tree"
"What Good is a Rotten Log?"
Call 765-6366 for copies

Man's Impact on Environment
Brevard County
Marjorie Ebersback, Coordinator
Center for Environmental Learning
615 Seminole Drive
Rocklege, Fla. 32955
"Description of a Marsh" Pp 34-40
"General Abiotic Studies of the Investigation Site" Pp 64-67

The South Florida Study
The University of Florida
and National Park and Planning Divisions
Gainesville, Fla. Pp 1-22

Man and Environment
Robert H. McCabe and R. F. Mines
Prentice-Hall
Englewood Cliffs, N.J. $4.95 1972

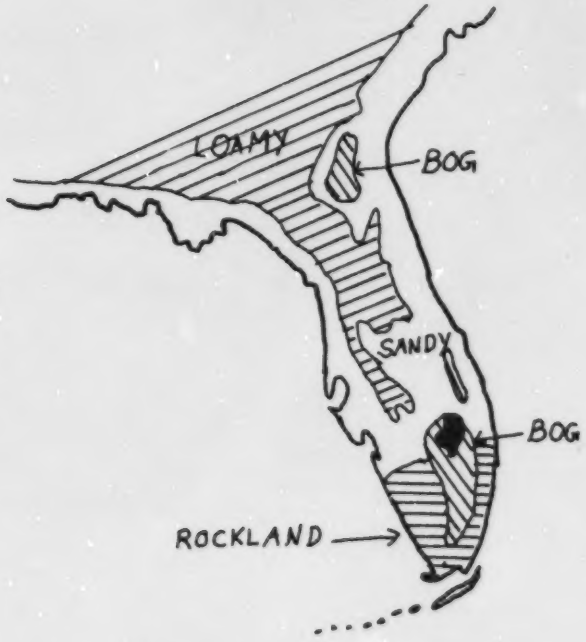
Film-strip:
"Florida and the Everglades"
R. J. Doyle Associates
Deerwood Road
Westport, Conn. 06880
(Prepared for Eastern Airlines)

Movie:
"Everglades"
The Broward County Audubon Society, Inc.
Karsten Rist, President
341 E. Tropical Way
Plantation, Fla. 33314
Tel 584-8006

GEOLOGY

Unit Preview

The land known today as Florida, was developed through many stages and covering an extensive period of time. The different soils are a result of this change. Plant and animal life vary, depending upon the soil compositions.



EARLY FLORIDA LAND FORMATION

The Floridan Plateau is a projection of the continental land mass of North America which separates the deep waters of the Atlantic from the Gulf of Mexico. South of Palm Beach the eastern edge of the plateau lies only two to three miles off the Atlantic coast. In the Gulf of Mexico, the plateau extends more than 100 miles beyond the coast.

Alternating period of high and low water created the land forms of southern Florida. Limestone was deposited smoothed, and trowled by the action of the sea during periods of submergence.

Each successive sea level left its mark, and the beach terraces and scarps that marked the ancient shorelines can still be traced. Today the sea level is rising again at a rate of three inches per 100 years, and land building processes are active along the shore and on the ocean floor.

Florida was submerged except for Immokalee Island during the Sangamon interglacial period and the sea stood 42 feet above its present level. (Fig. A)

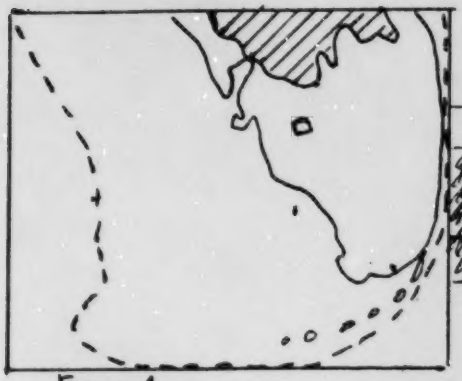


Figure A

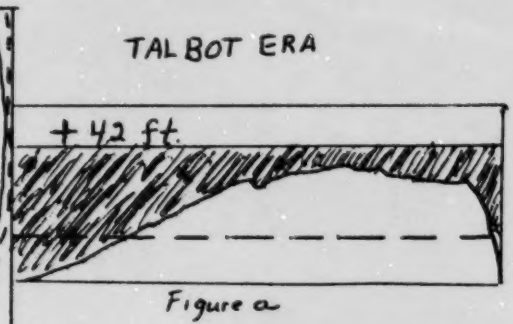


Figure a

Miami limestone was being deposited in the southeast, while the shell beds and sandy limestone of the Anastasia formation were accumulating as offshore bars. Coral reefs were flourishing at the southeastern edge of the plateau. These reefs were to become the Florida Keys.

The sea level fell to 60 feet below its present level during the Iowan glacial substage. (Fig. B)

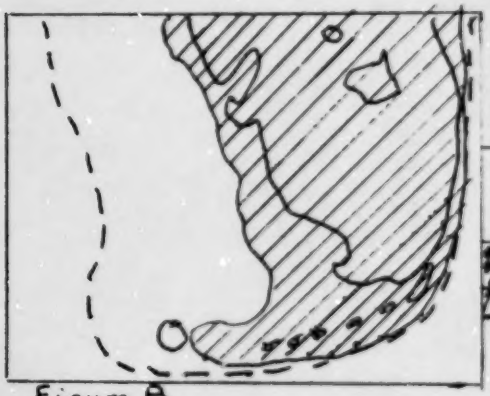


Figure B

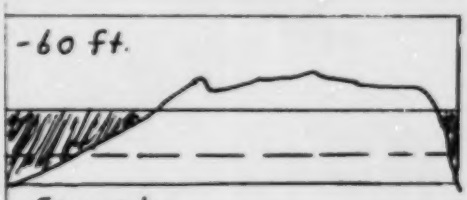


Figure b

Transverse channels were cut through the coastal ridge by the erosive force of the outflowing freshwater. The higher portions of the limestone ridge were pitted by solution holes, and sand transported by ocean currents built bars and dunes along the shore.

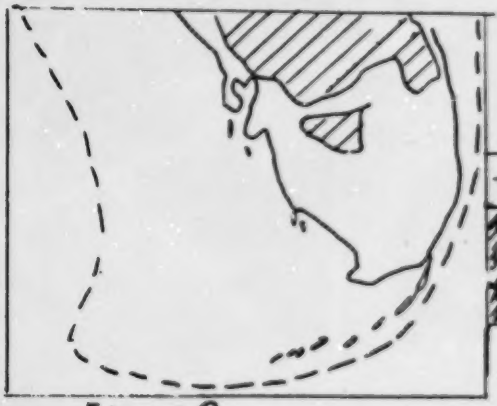


Figure C

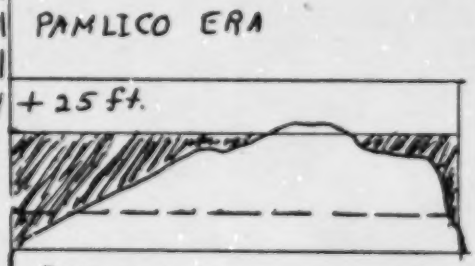


Figure c

When the sea level rose to the 25 foot level (Fig. C) Lake Okeechobee became a bay and Immokalee was an island again but larger than that of the Sangamon Period. Quartz sands, still being transported from the north, were distributed over the earlier formations as far south as Miami, as well as in the northern part of the Big Cypress, forming high dunes in some places.

Figure D

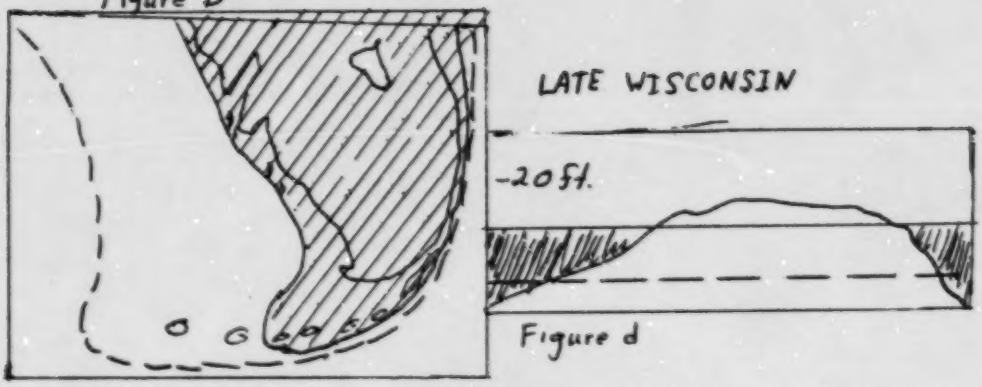


Figure d

The sea slowly retreated to minus 25 feet and formed a series of parallel shorelines. (Fig. D) These fossil beach ridges and dunes can be seen in many parts of southern Florida particularly in Martin and Palm Beach counties on the east coast, and at Marco and near the town of Everglades to the west. Limestone erosion resumed, and Lake Flirt marl was deposited near the Caloosahatchee River and in the Everglades.

As the glaciers retreated for the last time, the sea slowly rose to its present level, flooding the ends of existing streams to form modern bays and inlets. The tidelands of the Ten Thousand Islands, now separated from the mainland, were invaded by mangroves. Saw grass began to grow and decay, and form the peaty soils of the Everglades, while Lake Flirt marl continued to be deposited. Wave-borne sand and shell formed modern beaches and dunes on the mainland; in the clear waters of the Keys a new coral reef began to grow. (Fig. E)

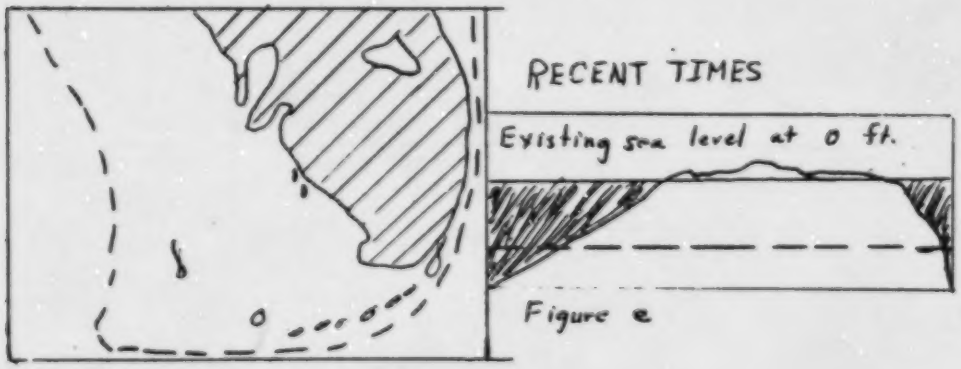


Figure e

Figure E

"Limestone" is the key word in Florida geology. There are 800 miles of it extending from Key West to Tallahassee, in layers 12,000 feet thick, reaching to the granite base of the continent. The main body was formed about 190,000 years ago, during periods of geological time when the Florida peninsula was below sea level and the processes of limestone deposition were active. At present these same processes are creating new limestone deposits in the seas around our shores.

Limestone is composed of calcite (calcium carbonate or $CzCO_3$). This material is deposited in various ways, each producing a different type of limestone.

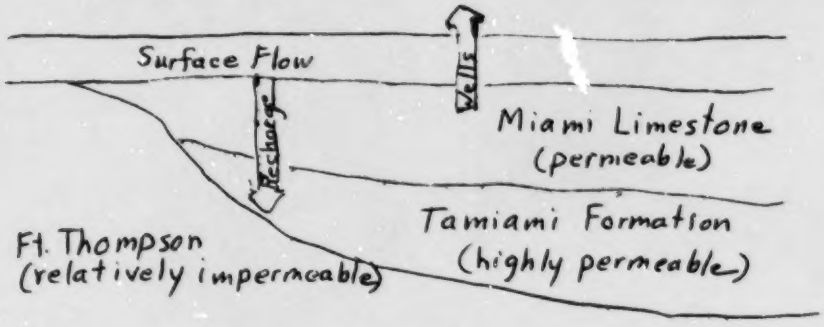
BRYOZOAN LIMESTONE

This type is formed by Bryozoan animals similar to the polyps that form coral. $CaCO_3$ is precipitated from the ocean water to form the shell and is simultaneously excreted into the surrounding mud, thereby creating a marl deposit.

MARL

Marl may be formed by excretion of $CaCO_3$ by marine organisms in salt water or in freshwater by precipitation through the action of the blue-green algal mat that covers the ground in wetlands. It is a fine-textured, clay like deposit that can become hardened over time into a dense limestone. Unlike other limestones, its lack of pore spaces makes it relatively impervious. The dominant erosional agent is underground water, which carries away dissolved limestone in solution. The chemical process begins in the atmosphere, which is composed of oxygen, nitrogen, and other gases, one of which is carbon dioxide (CO_2). As rain falls, it absorbs CO_2 from the air to form a weak acid that percolates through pore spaces and cracks in the limestone, slowly dissolving the rock. One foot of limestone is dissolved each 800 to 1000 years, which is a rapid rate of erosion.

This process created the famous Mammoth Cave of Kentucky, as well as the numerous lakes and sinkholes that are a striking feature of the South Florida landscape. The water, now "hard" because of the dissolved limestone ($CaCO_3$) it contains, flows underground until it reaches the sea. There, limestone deposition occurs again, completing the cycle.



SURFICIAL DEPOSITS

The surficial sand deposited during the Pamlico Period is usually highly permeable; the Talbot and Penholoway sands are less permeable, and the organic soils and marls are the least permeable.

GEOLOGY OF BROWARD COUNTY

Figure F illustrates the geological formation below the region's land surface.

MIAMI LIMESTONE

A soft, white to yellow limestone formation containing streaks of calcite, is located in Broward, Dade and the Everglades portion of Monroe counties. Varying from 1 to 40 feet in depth, it has an excellent water-bearing capacity, although yields are somewhat low because it quickly loses its water. This shallow aquifer yields high-quality water in areas which have not been contaminated by polluted runoff or groundwater. Its greatest yields occur where it meets the Fort Thompson formation, a highly productive aquifer.

FORT THOMPSON FORMATION

Varies in permeability, increasing in water-bearing capacity from north to south. In the northern part of the region where it underlies Lake Okeechobee, its impermeability enables the 717 square-mile lake to hold water. In this region the formation averages eight feet thick. Toward the south, in Palm Beach, Broward, and Dade counties, it forms part of the Biscayne Aquifer, which provides excellent potable water for the "Gold Coast."

TAMIAMI FORMATION

Is permeable in its upper portion, and forms the lower part of the Biscayne Aquifer. The lower and major portion of the Tamiami, forms the Floridan Aquiclude, sealing off the upper freshwater-bearing strata of the aquifer from the brackish water below.

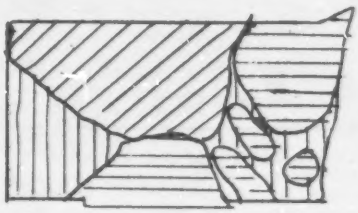


Figure F

Broward County Formations

SURFACE SOILS

The soils of southern Florida are generally shallow and geologically immature in comparison to similar soils in the rest of the state. The general distribution of surficial sands and organic soils are illustrated in Figure G. Because of high rainfall and the lack of topographic relief which would facilitate natural drainage the physical development of the soils of southern Florida has been somewhat slow in a geologic time sense. These shallow soils are immaturely profiled and infertile when cleared of vegetation.

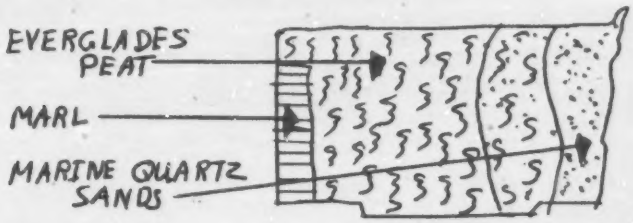


Figure G

The warm subtropical climate and rainfall leach nutrients from the exposed sands, marls, and rock land. The slightly more fertile bog soils (mucks and peats) remained mostly underwater until this century when extensive drainage projects lowered the water table, exposing them to rapid oxidation. Peat is an accumulation of partly decomposed and disintegrated organic materials, derived mostly from plants. This material naturally accumulates where water abounds and varies in consistency from fibrous, matted, turflike material to a mudlike plastic ooze.

Muck is more completely broken down, and the plant fibers are no longer recognizable. It is usually granular to powdery and much darker in color than the peat from which it was derived. Much Everglades farmland is surfaced by muck.

TEACHER GUIDELINES

for

GEOLOGY

Although a comparatively new state in the United States, Florida has ancient origins. A study of local soils and their relationship to the type of vegetation which thrives naturally under these circumstances is an important concept.

Recommended investigations and references are included in "Source of Information".

STUDENT INQUIRY
FORMATION OF FLORIDA LAND MASS

Examine the soil in your school yard and your own yard. To compare, take a 200 gram sample of each.

Describe each, as to texture, color, smell, water holding capacity and type of vegetation found growing there. The following exercises will help you to describe your samples accurately.

1. How deep is the surface layer of soil? (Point where you will find different color, texture, etc.)

2. How do you think this soil was developed?

3. At what period in time would you estimate this soil began forming?

4. What elements do you think are contained in these samples?

5. What is the elevation at your two sample sites?

6. Draw a soil profile for your site.

7. Test 5 g of each soil sample for pH.

8. Make a list of plants which prefer acidic soils; plants which prefer alkaline soils.

9. Measure the moisture content of 100 g of each sample.

10. Measure the water-holding capacity of the same 100 g samples.

11. Limestone is produced from South Florida soils. What are some uses of limestone?

12. Florida rates second in sale of all vegetables. What vegetables are grown commercially in south east Florida?

13. The term "soil conservation" was first used in 1910. Express, in your own words, what you think soil conservation means.

VOCABULARY

for

GEOLOGY

coral - a hard calcerous formation of skeletal deposits made by marine animals

erosion - a state of being changed

excretion - a process of elimination or getting rid of

formation - a geological process of developing in layers

limestone - rock, consisting of calcium carbonate, produced by living organisms such as coral or other shell-producing animals

nutrients - containing a life-giving substance

plateau - a broad, level surface

succession - an order or line of those entitled to live

surficial - surface deposits lying over older formations of soil

transverse - a cross-cut; lying across

SOURCE OF INFORMATION

for

GEOLOGY

Environmental Quality by Design
Albert R. Veri, William W. Jenna, Jr., Dorothy Eden Bergmaschi, University of Miami Press, Coral Gables, Fla. ($25.00)

A Guide to the Study of Soil Ecology
William A. Andrews, Prentice - Hall, Englewood, N. J. 1973

Man's Impact on the Environment
Brevard County
Marjorie Ebersback, Coordinator
Center for Environmental Learning
615 Seminole Drive
Rockledge, Florida 32955
"Soil Investigations"
Color and Depth Pg 42-44
Acid and Alkaline Analysis Pp 45-47
Moisture Content Pg 48-50

NATURAL WATER MANAGEMENT

Unit Preview

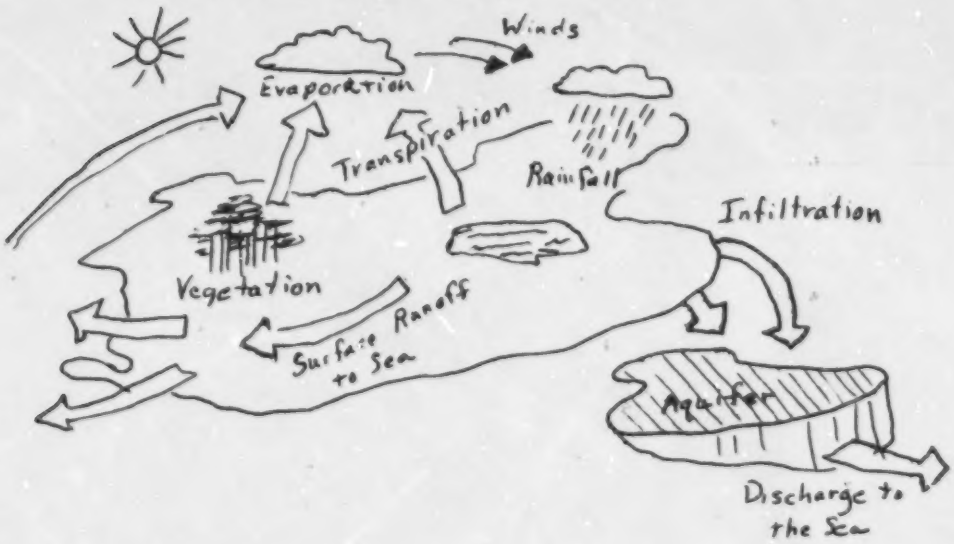
South Florida, due to its location and popularity, is unique in its water needs. Since the fresh water supply is directly related to rainfall, storage, runoff and waste are a major concern for all living creatures survival in this area.

Natural Water Management

South Florida's latitudinal position and peninsular shape are chiefly responsible for prevailing patterns of sunlight, temperature and rainfall. Local convection and world weather patterns generally provide a moderately high average annual rain fall with a summer rainy season and a winter dry season.

Records of the past century show long term cyclical rainfall patterns with below average rainfall may last for several years.

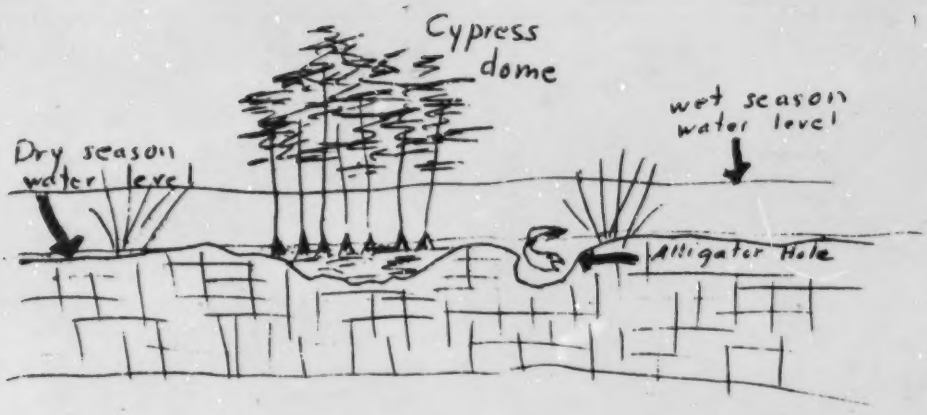
Hydrological cycle in South Florida



Water enters the system by rainfall but leaves the system by four pathways. Ninety percent of annual rainfall

is lost by evaporation and transpiration. The third greatest amount of water leaves the region as surface water runoff entering the estuaries and the ocean. The lesser amounts infiltrate the soil and become part of the ground water system contained within the extensive aquifers underlying the land surface.

Many natural water storage mechanisms evolved within the region to reduce the disruptive impact of daily, seasonal and yearly rainfall extremes. Highly porous limestone aquifers, ponds, lakes, sponge-like peat soils, and broad, thickly vegetated sloughs and swamps retained surpluses from the wet season for use during the dry season. Water retention was faciliated by flat topography and dense vegetation, which slowed overland flow, increasing the opportunity for infiltration into the more slowly moving ground water flow system.



The natural program of water management utilized the diversity of water storage mechanisms each uniquely suited to store and conserve the precious water.

The network of water movements through the primative Kissimmee-Everglades Basin linked the series of subregions into a regional whole.

Surface Water Movements and Storage Areas

1. Kissimmee River Floor Plain
2. Allapattah Slough
3. Loxahatchee Slough
4. Hillsboro Lakes Marsh
5. Everglades
6. Taylor Slough
7. Shark River Slough
8. Big Cypress Swamp
9. Fahahatchee Strand
10. Okaloacoochee Slough
11. Devil's Garden Slough
12. Caloosahatchee River
13. Lake Okeechobee

TEACHER GUIDELINES

WATER INVESTIGATION

Encourage students to investigate all forms of life in any local water ecosystem. Water test kits are available to determine levels of oxygen, nitrogen, phosphorus and pH. These levels relate directly to the kind of life found in a particular area.

Refer to "Sources of Information"

STUDENT ACTIVITY

WATER INVESTIGATION

Collect 50-100 ml of a water sample from a pond, lake or canal in your area. While you are getting your sample, look for living things in the water. Some things you might find are: algae, duck weed, water hyacinths, protozoans (microscopic) hydra, flatworms and fish. If you cannot identify the things you find, describe; giving color, size, shape and if found near the surface or bottom.

1. Test 50 ml of your water sample for pH measurement.

2. Does the pH reading correspond to the type of life normally found within this range?

3. In what ways have the drainage systems of the Everglades changed the natural state of land and water? In what ways have they been beneficial to the inhabitants?

4. What are the possibilities and problems using recycled water?

5. By what Coliform count standard does Broward County consider its water to be polluted and a health hazard?

6. In what ways can the present water management be changed to improve water needs for humans and wildlife?

7. What is the meaning of "As the Gold Coast goes, so goes the Everglades"?

8. The terms ecology and economy are derived from the Greek word "oikos", meaning "home". What steps has your city taken to provide a home for you and the Everglades ecosystem?

VOCABULARY

WATER INVESTIGATION

aquifer - a water-bearing structure of the earth.

biochemical oxygen demand (B.O.D)- amount of oxygen necessary for decomposing of organic matter by bacteria or mold.

biotic - pertaining to living organisms.

eutrophication - over-fertilization of water, characterized by low levels of oxygen.

infiltration - to pass in or through a substance.

inorganic - pertaining to non-living matter.

pH - level of acidity or alkalinity.

transpiration - water vapor given off from the surface of plants.

SOURCES OF INFORMATION

WATER INVESTIGATION

IEE Program, Book 2
Broward County
"Hydrology of Southeast Florida"
"Sewage and Something Else"
"Sewage Treatment in Broward County"
"Membrane Filter Technique for Coliform Bacteria"

South Florida Water Management District
Public Information Division
Lawrence J. Nunn
3301 Gun Club Road
PO Box V
West Palm Beach, Florida 33402
Tel: 1-686-8800

Environmental Quality by Design
Albert R. Veri, William W. Jenna Jr., Dorothy Eden Bergmaschi, University of Miami Press, Coral Gables, Fla. ($25.00)

Man's Impact on Environment
Brevard County
Marjorie Ebersbach, Coordinator
Center for Environmental Learning
615 Seminole Drive
Rockledge, Florida 32955

"The Nitrogen Cycle and Experiments" Pg 53-57
"The Phosphorus Cycle and Experiments" Pg 58-60
"Rainfall Factors" Pg 79-84
"Water Control" Pg 85-95
"Water Investigations - Acid and Alkaline Analysis" Pp 61-63
"Wildlife and Water" Pp 105-114

The South Florida Study
The University of Florida and
National Park and Planning Divisions
Gainesville, Florida

Field Trip to:
Dixie Water Treatment Plant (Ft. Lauderdale's oldest)
Call Rocky Block for arrangements
Tel: 791-3480

PLANT LIFE

Unit Preview

A tree is an ecosystem. It may provide shelter, food and cover for animals as well as plants.

Identification of trees by shape or leaf structure can provide a great deal of information regarding forms of life which are dependent upon it.

Plants found in the South Florida area may be native or exotic; poisonous or edible. It is imperative, that every resident of this part of the state, have a knowledge of the hazards or acceptability of the local plants.

TREES

Trees live longer and grow taller and larger in mass than any other living thing on the land and in the sea. Despite their adaption to life on this planet, they too grow; wane; die; decay.

Trees die from many causes-diseases, pollution, fire, environmental extremes, insects, animals. The life-span of microorganisms is measured in days, and their size in thousandths of an inch. But, without them no organic matter would decompose, there would be no reuse of once-living materials, and no continuation of life. Some are beneficial; some destructive.

Trees live longer, grow taller, and larger than other organisms because they have effective ways of resisting death and decay. Trees have developed built-in systems of protection against wounds and infection by microorganism.

Microorganisms which cause decay sometimes give a protective barrier set up by the tree after wounding. When the tree's vigor is low and the wounds are severe the tree is more receptive to invading microorganisms. When the tree's vigor is high and the wounds are minor, the advantage tips toward the tree. However, the cumulative effects of many minor stress factors over time also tip the balance in favor of the micro-organisms.

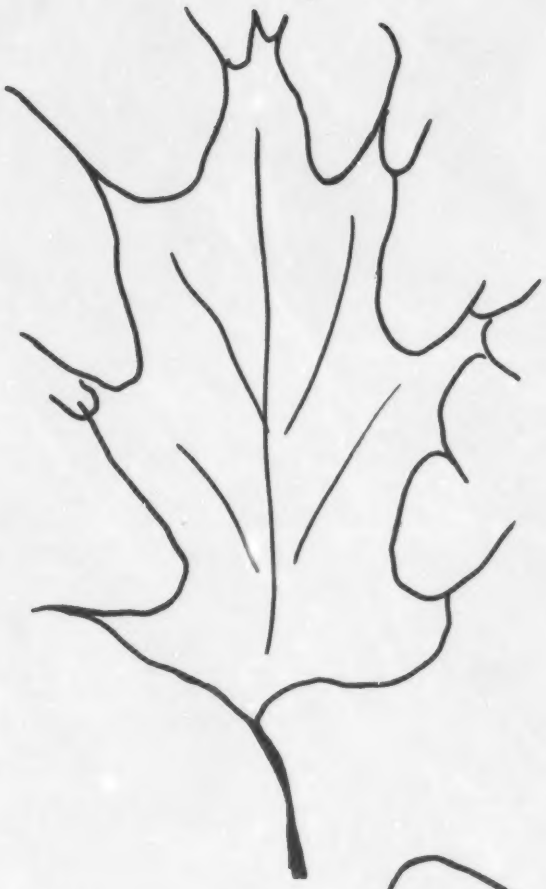
A tree should be thought of as a multiple plant, not a single one, for the cambium-the layer of tissue one cell thick between the wood and the bark-produces a new layer of wood and bark tissue every growing season. In a sense, a new tree envelops the old one every year.

LEAVES

Leaves have many shapes and sizes and when trying to classify them, their variation may be used as a guide. Example: a maple leaf has v-shape sinuses, it usually is classified as a soft maple; if it has a u-shape sinus, it is a hard maple. Some oak leaves have points on their margins, for example, a black oak or red oak leaf. Other oak leaves have smooth rounded margins; they usually belong to the White oak family. Below are some drawings of the maple and oak leaves.

U-shape sinuses
(hard maple leaf)

maple leaf-v-shape sinuses
(soft maple)



Oak leaf-sharp
points on margin
(Black or Red oak)

Oak leaf-smooth rounded margins
(White oak family)

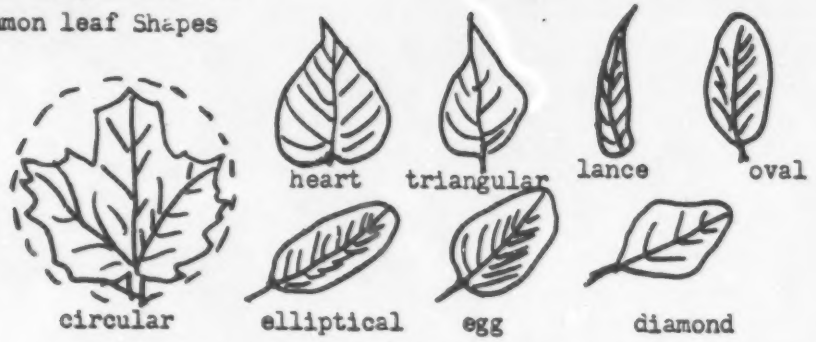
Pine needles usually grow in groups of two, three, and five. The spruce needles always occur as a single needle.

Pine needles grow in two, three, or four's

Spruce needle grows singly

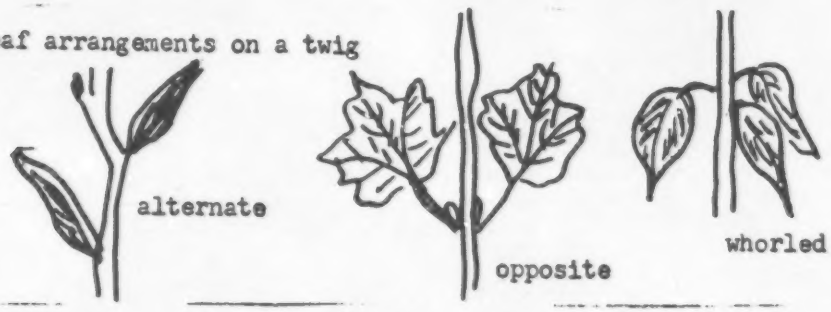
ACTIVITY:
Find as many leaves which have the leaf shapes found in the diagram below.

Common leaf Shapes



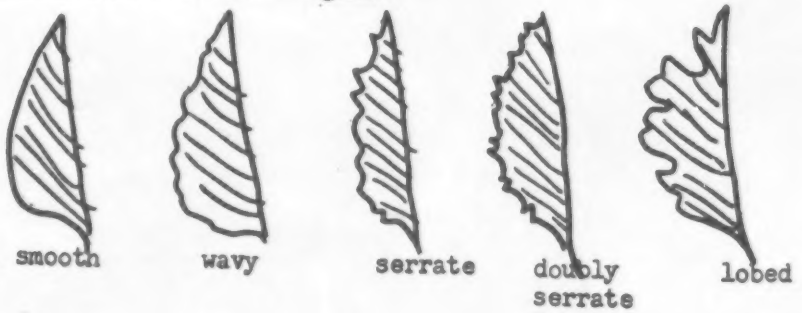
Locate as many trees as possible with the leaf arrangements found below. Name the tree.

Leaf arrangements on a twig

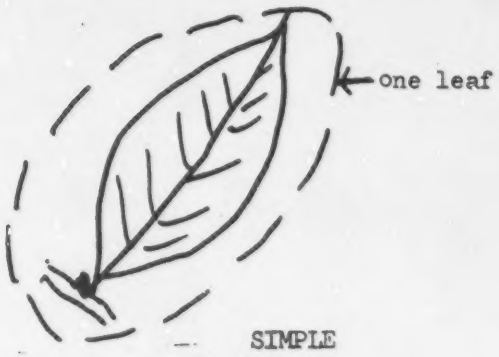


Examine some trees in your neighborhood or local area to see which type of leaf margin is most common. Diagram of leaf margin below.

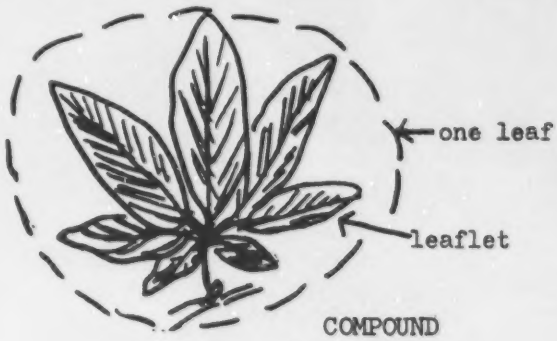
common types of leaf margins



Locate on the school grounds or nearby any trees, shrubs, weeds, or vines which demonstrate a simple leaf or the types of compound leaves in the drawing below. Group by pinnate or palmate. Note that a simple leaf usually has one blade, and a bud at the tip of its petiole. A compound leaf has 2 or more leaflets and a bud at the base of its petiole or stem

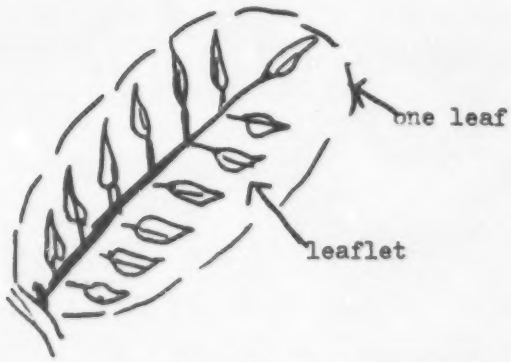


SIMPLE

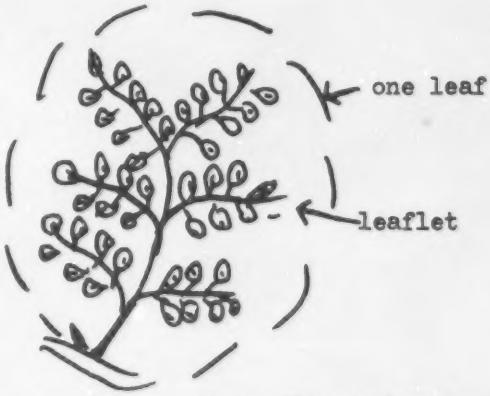


COMPOUND

A once compound leaf has one main petiole and the leaflets are arranged pinnately or on the side of the petiole. A twice compound leaf has one main petiole and then secondary petioles arranged on the side of the main petiole. The leaflets are arranged pinnately or on the sides of the secondary petioles. Locate some leaves resembling those in the drawing below, classify and name or identify the leaf.



Once Pinnately Compound



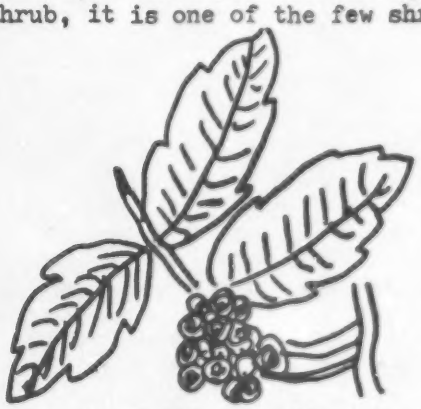
Twice Pinnately Compound

EXOTIC TREES

IDENTIFICATION: There are various trees which you will see in the Everglades. You should become acquainted with their bark, branches, and leaves. Learn to identify.

AUSTRALIAN PINE - You have probably heard the eerie sound of the wind blowing through its "leaves" or "needles". This tree looks like a pine tree but it isn't. The "needles" or "leaves" are really jointed branchlets (tiny branches). The unusual feature of this tree is that it really has no leaves at all. The woody cone-like fruits are not really cones. The tree is a native of Australia. Either by ship or water the seeds have traveled to distant places, including South Florida where it is referred to as "exotics" or "aliens" (meaning not native). Men originally planted the trees for windbreaks and hedges, but they were really creating a monster. Because of their salt resistant they adapt well to sand, sun, and shade. They grow rapidly to heights of 150 feet, and they choke out other native plants. Their roots tear up underground plumbing and sidewalks, their quantities of droppings branchlets and fruits create a mess, and birds seem to avoid them and seek habitat elsewhere.

FLORIDA HOLLY
BRAZILIAN PEPPER - As the name implies, Brazilian Pepper is native to Brazil. Now planted through South Florida as an ornamental shrub, it is one of the few shrubs which can escape cultivation and grow wild as small trees. The red berries are a favorite among birds and they become the chief means for spreading the seeds. The shrub, growing to 20 feet in height, can now be seen growing within any native plant habitat in South Florida. Often called Florida Holly by local residents, because of the resemblance of the red berries to holly berries, Brazilian Pepper is not a holly, but related to the cashew and sumac. The leaves are a source of turpentine. Crush them with your fingers and smell. There are male and female trees. The commonly seen red berries appear only on the female tree.



MELALEUCA - The Paper Tree was introduced from Australia in the early 1900's and is now a familiar part of the Florida landscape. Its white flowers, which resemble bottle-brushes, have an unpleasant odor and cause allergic reactions for many people. The gray seed-pods contain large numbers of tiny, brown seeds that are wind distributed. Oil, obtained by distillation of foliage of several species of Eucalyptus, also in the Myrtle family, is used in making medicines, and for flavoring. The oil of Melaleuca is used as a local remedy in the Orient, and is exported to some extent to Europe. At flowering times these trees, also called Cajeput or Punk trees, are covered with white spikes. Most native animals cannot utilize Melaleuca, therefore, animal populations in invaded areas decrease.

NATIVE PLANTS

CABBAGE PALM
Sabal palmetto

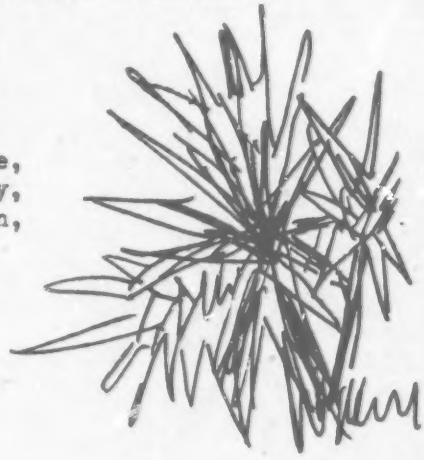
The state tree of Florida, Cabbage Palm, is probably the most familiar and most frequently seen of Florida palms. The name comes from the fact that the "bud" in the center of a newly sprouted tree is sometimes removed and cooked for major foods of the early Florida Indians, and is frequently eaten today. The product is sold canned and precooked in the supermarket under the name of Swamp Cabbage. The removal of the bud will result in the death of the tree. "Palmetto honey" is derived from the flowers of this tree and the short, shrubby saw-palmetto, which grows in association with it. The tree grows natively in the Bahamas and Southeastern US as far north as North Carolina. Projections of old root stalks, which are often referred to as "boots" emerge from trunk and become a ready field mark for easy identification. As the tree becomes taller, the "boots" are shed. An average Cabbage Palm will have a smooth appearing trunk with "boots" only near the top. Sometimes the tree grows between 40 and 60 feet. The broad leaves are not as long as many palms and appear distinctly folded in the middle. The round fruits are dark brown in color, about ½" wide.

STRANGELER FIG

This native tree is a perfect example of a SYMBIOTIC relationship (a close relationship between two things). It begins life in the hole or nook of another tree, its seed having been dropped there by a bird. Its host tree is usually a sabal palm or live oak. The little plant starts out as an EPIPHYTE (ep-ih-fite) a plant which uses another plant for lodging but gets its nourishment from air, sunshine, and moisture. This symbiotic relationship in which one thing benefits and the other is neither hurt nor helped is called COMMENSALISM. A strange thing happens to this commensalistic relationship. As the little plant grows it sends many roots down to the ground. Its branches grow high and wide-spread, robbing the host tree of light. Eventually the winding roots twining around the trunk and limbs of the host tree strangle it to death. At that point the strangler becomes a totally self-supporting tree, but sometimes without the support of its host it collapses. The strangler is related to the banyan tree. It has small stalkless orange-yellow to red figs about three-quarters of an inch long which can be eaten by are not too tasty so are usually left for the birds. Its leaves are thick, leathery, glossy, dark green on the top and lighter and downy on the underside. They are two to four inches long, narrowing at each end.

CUSTARD APPLE - Tree to 45', somewhat swollen at base, with pale bark; often laden with air-plants. Leaves alternate, ovate or elliptic with pointed tip, 3-7" long leathery, bright-green, glossy above, pale below; aromatic. Flowers whitish or greenish-yellow, 1 in. wide, conical with six fleshy petals, the three outer ones red-spotted at inner base, enclosing the three smaller ones. Fruit heart-shaped, 3-5" long, yellow-skinned. Seeds are numerous and are seen in great numbers floating in swamp water and apparently remain viable for some time before they find lodgment and germinate. Fruit is edible raw.

SAW PALMETTO - This tree usually has a horizontal trunk that can be partly buried. The crown then forms what appears to be a large shrub about 10' high. Occasionally trees with upright or leaning trunks can be found. The leaves are up to three feet wide and lack a madrib. These palms make excellent landscaping plants, but should be left when buildings are constructed rather than added later since they grow slowly and are difficult to transplant. The palm heart is edible, but taking it kills the tree. The flowers are a good source of nectar for honeybees. The ripe, black fruits are edible, but have an oily, unpleasant taste. The stems yield tannin, cork substitute and fiber for wallboard.



BALD CYPRESS - This tree can grow to 150' tall. Its thin, needle-like leaves are deciduous. Although the tree grows best in low, wet places, it can survive as a landscape plant under drier conditions. Because of the excellent durability of the wood, most of the large trees in Florida have been cut. Pollen is produced in long, clustered structures called catkins. Seeds are formed in globe-shaped cones that are about an inch in diameter. Ducks and squirrels eat the cone scales, seeds and galls.

SWEET BAY - Although this species can grow into a large tree, in our area it is usually 20' tall or less. Cream-colored, very fragrant flowers appear in early summer and at irregular intervals. The fruits are woody and cone-like. They open at several slits, exposing scarlet seeds. Aromatic, dark green leaves are smooth and silvery below. A relative of Sweet Bay, Magnolia grandiflora, is popular as a landscape tree throughout the South-eastern U.S.

GUMBO LIMBO - This tree grows throughout South Florida, Central American and the West Indies. The tree is most easily recognized by its smooth, reddish-brown bark which peels like thin paper. One of the easiest trees to transplant, a green branch cut from the tree will soon sprout roots when planted in the ground. The wood is extremely light and is sometimes used to make fishing floats.

RED MAPLE - The Red Maple's habit of growing within swamps and other wet areas through the South has given this tree the popular name of Swamp Maple or Pond Maple. Farther North the tree is common on the slopes of the Appalachians where it occasionally reaches heights of 125 feet and five foot diameters. The term "red", which is also the translation of "rubrum", refers to the colorful autumn reds the leaves attain in the Fall of the year, and the bright red flowers of the Spring. The tree has a rapid growth and is widely used as an ornamental. It is widespread through the Eastern U.S. and South Florida.

LIVE OAK
LAUREL OAK

Most often confused with Live Oak in our area, this tree grows along waterways and wet areas, but has been planted throughout neighborhoods. The leaves are narrower than those of Live Oak with smooth edges but frequently containing sharpened lobes. The acorns are very rounded, about as wide as they are long. (Live Oak acorns are much longer.) The bark does not contain the deep cuts or fissures that Live Oak does. Laurel Oak is named for its shiny leaves, which resemble laurel. Semi-evergreen, the leaves remain on the tree through the Winter and Fall in early Spring. Other than being burned for heat or fuel, the wood is of little commercial value. Often miscalled "water oak" in South Florida. There is a true water oak (Quercus nigra) but it is not completely evergreen.

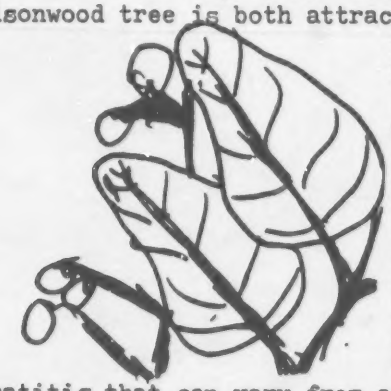
RED BAY TREES - The bay trees are dominant in the area of the Everglades-Markham Park, so we call this a bay forest. The bay forest is a semi-swamp growth distinct from other broadleaf hammock plant communities. The bay trees become established in a seasonally wet clay and silty swamp region such as located near the park. Other trees and shrubs associated here are the Bayberry, Dahoon Holly, Rapanea and Cocoplum. These are the bay leaves so commonly used as herbs. The Red Bay is in the Laurel family and is directly related to the Avocado, and Sassafras.

DAHOON HOLLY - A small tree (ten to twenty feet), Dahoon Holly is often not recognized as a holly because of its lack of conspicious spines on the leaves. On close examination, however, tiny teeth can be found near the tips on some leaves. Small white male and female flowers usually occur on different trees. Female flowers mature to bright red fruits that are used in Christmas decorations but are not edible. Tea made from the leaves produces dizziness and a laxative effect. A related species, L. vomitoria, was used to make the "black drink" of Indian ceremonies.

MASTIC - A majestic hammock tree, Mastic grows to 60' tall. The glossy, yellow-green leaves are on long stalks, which allow them to flutter easily in the breeze. Wavy leaf margins are a good identifying characteristic. Small yellowish flowers grow in clusters on the leafless portions of the twigs. Smooth yellow fruits about an inch long are attached to the twigs on short stalks. The fruits are edible, but contain a gummy white latex. Florida tree snails (Liguus sp.) can be found on several kinds of hammock trees, but seem to especially like Mastics. They eat various kinds of algae and fungi that grow on the bark. Some snails have brightly colored shells, but should not be collected alive since they are now comparatively rare and are protected by law.

GUAVA - Guava is an introduced Central American tree with smooth, reddish, flaky bark, slightly resembling sycamore bark of the north. It is a small handsome tree, with attractive white flowers and edible yellow fruits. The fruits begin to ripen in May and June. Birds, squirrels and other mammals enjoy guava as a part of their diet. The wood is very tough and strong. Notice how this tree is stretching for the sunlight, displaying the basic need to reach the source of life. In a forested region as this one, the struggle for sunlight and root food is fierce, although we seldom realize there is competition of any kind. The fruit can be sliced and served with milk and sugar, jellied, or guava pie.

POISONWOOD - A very common member of coastal hammocks, the Poisonwood tree is both attractive and dangerous. It has



reddish-brown thin, flaky outer bark and sticky sap that turns black on exposure to the air. The sap forms tarlike streaks on old or injured trees. The compound leaves have three to seven bright green, glossy leaflets. Minute, greenish-white flowers mature to form oval, three-fourths inch long brownish-yellow fruits. All parts of the plant are toxic to many people, producing a contact dermatitis that can vary from a mild rash to large blisters. Severe cases require hospitalization. Poisonwood is sometimes confused with non-poisonous Gumbo-Limbo, which it resembles. The leaflets of Gumbo Limbo have shorter stalks and are more pointed. Also, the fruits of Gumbo Limbo split open when ripe while Poisonwood fruits do not.

PIGEON PLUM - This large hammock tree (70 feet) has a tall, straight trunk and a compact, round top. The color, shape, and dimensions of the leaves vary with age, giving the foliage a diversified appearance, as "diversifolia" implies. Small, creamy white flowers occur in slender spikes. Hanging clusters of dark purple fruits appear in the fall. These are somewhat astringent, but can be eaten raw or made into jelly or wine. Pigeon Plums can be used in landscaping.

YUCCA

SPANISH BAYONET - This unusual plant may bring to mind visions of the Spanish Conquistadores in the early days of Florida's history. Its pointed dagger-like leaves growing outward from a thick trunk give it the nickname of "Spanish-bayonet". In the spring white waxy flowers grow upright from the center of the tree and appear as if they were stuck there by some unseen hand. The yucca is found most often along coastal dunes or in any well drained soil. The fruit is long and rounded. It is purple and contains many seeds, which when cooked may be eaten as a cereal. The flower petals can be served in salad; the flowers may be dipped in butter and fried; and the flower stalk is considered tasty when it is peeled and boiled. An interesting relationship called "MUTUALISM" (Helping one another) exists between this plant and an insect called the yucca moth. The larvae of the yucca moth can only develop in yucca seeds. Without the female moth transferring pollen from one plant to another the yucca plant would not be pollinated. On the Yucatan Peninsula where the tree is raised commercially, every bit of the plant is used for some purpose - even the making of fiber for clothing.

TEACHER GUIDELINES

for

PLANT LIFE

The earth is a limited natural system. Outdoor observation is recommended.

A. To encourage students to look for details, collect a variety of leaf shapes and designs including simple, compound; pinnate and palmate.

Group students in 4-6 per table. Place a varied selection on each table and ask students to classify the leaves as to shape, color, petioles or venetion.

B. This outdoor activity may be in the school yard, field or wooded area near you.

1. Ask students to describe how the area might have looked 25 years ago
2. Look for evidence of change (natural or man-made)
3. List the man-made changes
4. Make note of signs of lightening, fire, excessive rain fall (natural)
5. Does the site now support native vegetation?
6. Record appearance of height of vegetation, condition of leaves, bark of trees and ground cover
7. Do these observations tell you anything of the past?
8. Using a southern Florida guide, such as, The American Southeast, Herbert S. Zinn, Golden Press, N.Y. (many good sources available in local libraries), have students look for identifying overall shapes of trees and shrubs.

C. Have students find a quiet spot. Supply them with a sheet of drawing paper, crayons or charcoal. (an interesting medium can be obtained from nature, itself; such as rubbing various colored flowers or leaves on the paper for natural color)

1. Have students make a sketch of something that interests them. When the sketches are finished, give the following verbal directions, one at a time.

a) Write one word to name the subject of the sketch
b) Write two descriptive words (what it looks like)
c) Write three action words about the title. (changes taking place or what is happening to it)
d) Write a short phrase (4-5 words) that tells how the subject of your sketch affects the rest of the environment (it's value or thought about the subject)
e) Write one feeling word that sums up everything about the subject.
f) You have just written a poem about your environment

Be sure to display the varied interpretations of the area

For further reading refer to:
Man's Impact on Environment
Brevard County
Marjorie Ebersbach, Coordinator
Center for Environmental Learning
615 Seminole Drive
Rockledge, Florida 32955
"Plant Life in the Everglades" Pg 70-74
"Changes in Everglades Vegetation" Pg 75-78

Field trips to local parks (within your area) can be rewarding. Refer to the Recreation section for arrangements nearest your locality or call Parks and Recreation Division, Tel 765-5920

Student Activities

1. What is the method of measuring an object in which the top cannot be reached? (MacBean-Page 3, Trees)

2. Choose any tree and measure its height.

3. How does the circumference of a tree change over a long period of time?

4. What are the different layers of wood that can be found in the trunk of a tree? Draw and label cross section.

5. Choose a tree and describe the bark texture and characteristics. Study with magnifying glass, and using a piece of paper and crayon, place sheet of paper on bark and lightly rub the crayon on the paper. The texture of the bark will be transferred to the paper.

6. Check some trees near a building. Check for the growth position. Compare trees near a building to trees growing out in the open exposed to constant sunlight. Also compare trees in which the sunlight only is exposed to one side of the tree.

7. Look for old wounds on the trunk of a tree. Observe the bark growing over or around the wounds.

8. Observe and draw shapes of various trees to identify. Note the direction of the branch growth. This will help in identification.

VOCABULARY

PLANT LIFE

commensalism - one thing benefits from another but neither helps nor hinders growth

decomposers - bacteria and other organisms which break down dead material to the elements

epiphyte - using another plant for support but is self-sufficient

exotics - not native to the area

habitat - home; place of residence

leaflets - resembles a single leaf but arranged in a group

mutualism - helping one another

palmate - veins branched like fingers on the hand

petiole - a slender stem that supports a leaf

pinnate - veins branched like a feather

sinuses - indentations of a leaf

symbiotic - growing together; each helping the other

REFERENCE

A GUIDE TO THE ECOLOGICAL STUDY OF LOCAL PLANTS, Interdisciplinary Environmental Education Project, an ESEA Title III project, The School Board of Broward County, Florida, by Marilyn Laskey and Nancy Hougendobler.

A TREE HURTS, TOO, Dr. Alex L. Shigo, Forest Service U.S. Department of Agriculture.

COMMON PLANTS OF PALM BEACH AND BROWARD COUNTIES, Sandra Austin & Nancy Domigan, Pine Jog Environmental Sciences Center of FAU Foundation, Inc.

EDIBLE WILD PLANTS, Castellow Hammock Environmental Education Center, Metropolitan Dade County Park and Recreation Department.

FIELD STUDY GUIDE-INTRODUCTION TO AN ECOSYSTEM-A TREE., Interdisciplinary Environmental Education Broward County, Florida, by Marilyn Laskey.

FLORIDA PLANT SELECTOR, Lewis Maxwell, Publisher, 6230 Travis Boulevard, Tampa, Florida 33610.

FOREST TREES OF FLORIDA, Fla. Division of Forestry, Wilbur R. Matton.

HOW A TREE GROWS, U. S. Department of Agriculture,-Forest Service and Soil Conservation Service, Washington, D.C.

KEY TO THE TREES OF LEE COUNTY, Environmental Education Program, Lee County, Fla., Title III ESEA.

NARRATIVE FOR A SELF-GUIDED TOUR OF THE NATURE TRAIL IN MARKHAM PARK, by Gilbert R. MacAdam, Broward County Division of Parks and Beaches.

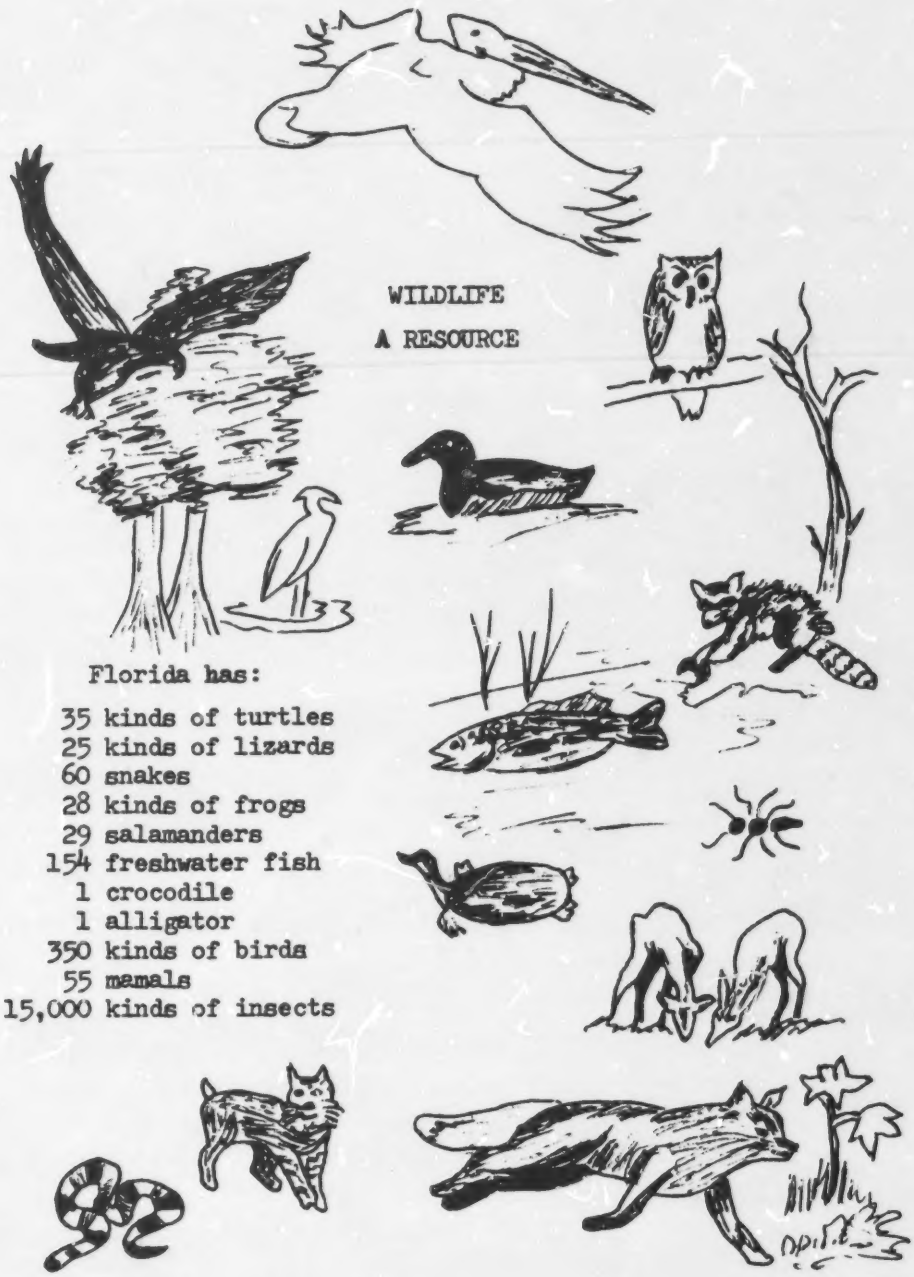
ON CAMPUS TEACHING ACTIVITY GUIDE, Environmental Education Program, Lee County, Florida, Title III ESEA.

THE SINISTER GARDEN, A Guide to the Most Common Poisonous Plants, Wyeth Laboratories, Division of American Home Products Corporation, New York, New York.

REFERENCE

TREES-Examining Your Environment, J. C. MacBean, A Stecher, D. F. Wentworth, and J.K. Couchman, Holt, Rinehard & Winston of Canada, Limited, 1972.

WILD PLANTS FOR SURVIVAL IN SOUTH FLORIDA, Julia F. Morton, Hurricane House Publishers, Inc., 14301 S.W. 87th Ave., Miami, Florida 33158



WILDLIFE
A RESOURCE

Florida has:

35 kinds of turtles
25 kinds of lizards
60 snakes
28 kinds of frogs
29 salamanders
154 freshwater fish
1 crocodile
1 alligator
350 kinds of birds
55 mamals
15,000 kinds of insects

ANIMAL WILDLIFE AS

A RESOURCE

WILDLIFE IS A RENEWABLE RESOURCE BUT IT CANNOT BE STOCKPILED

Iron ore is there: it can be used; it can be reused; but it can never be reproduced. One bass can serve as a dinner but the bass "that got away" can go on to produce more baby bass.

Gold can be mined, made into ornaments and stockpiled for ages. King Tut's treasure is centuries old. Wildlife populations grow and reproduce but we can't save a stack of animals forever.

SPECIES THAT CONTINUE TO SURVIVE ADAPT TO CHANGING ENVIRONMENTAL CONDITIONS

Before man barged in, animal populations decreased and increased in cyclical fashion, adapted or died out.

If good conditions prevailed lots of animals were born. If environmental factors changed or overpopulation occurred (and, therefore, habitat destruction) many animals died. Over millions of years, environmental factors changed. Some animals, as the alligator, adapted and reproduced generation after generation. Some didn't and died, as the dinosaur.

THE AREA WHERE WILD ANIMALS CAN LIVE IN A NATURAL STATE IS BECOMING LESS

The area allocated to wildlife is becoming less and less. It is being innundated by people seeking places to live and follow recreational pursuits.

The decision in Florida has been to charge the Florida Game and Freshwater Fish Commission with the responsibility for managing "our wildlife resource."

The U. S. Park Service and the U. S. Game and Fish Commission manage wildlife in national parks.

Agencies and sportman's clubs work together to improve habitat for animals, as well as, provide recreational opportunities for people by:

controlled burning of forest and sawgrass
building of deer islands
construction of cover or nesting sites
tagging birds
studying the habitat needs of animals
relocating animals
medicating diseased animals
regulating hunting and fishing
stopping poachers
and more . . .

EXOTIC SPECIES ARE CAUSING CHANGES IN THE ENVIRONMENT

Seeds have already been planted which may cause permanent habitat change in Florida. What's a good idea today may be an overpowering disaster tomorrow.

Maleluca trees, walking catfish and other exotic species are multiplying beyond the ability of natural organisms to stem the multiplication of their numbers. Before man provided transportation for a species, organisms stayed in an area where the species fit into the eat-and-be eaten pattern. A species took matter and energy from its environment. The natural enemies of the species used it to produce matter and energy. If, when exotics move into a new area, the species can adapt to conditions in an environment, it takes matter and energy from the environment. If no organisms in the new environment is adapted for using that species to produce matter and energy, the exotic grows and reproduces, and reproduces, and reproduces, and reproduces . . . . .

BUFO MARINA

An exotic like the Bufo Marina toad eats the same food as some of the native species of toads. The Bufo's isn't eaten by anything here. It's too big and it's poisonous. So which one would you expect to take over the habitat - that niche which belongs to insect-eating toads? What difference would it make if Bufo's did take over?

Do you know that you, a South Floridian, might see in Broward County a:

a walking Siamese catfish crawl out of a canal choked with Asian hydrilla weed;
a Colombian iguana scampering through Australian pines beneath a flock of Amazonian parakeets;
a jumbo South American toad hopping past an Australian melaleuca tree;
a boa constrictor; a South American myna bird; an Asian Bulbous finch; a Spot Rusted Oriole; or a black acara (South American tropical fish).

INTERDEPENDENCE

PRODUCERS - CONSUMERS

"Eat and/or be eaten" is the law of nature. The sun is the source of energy. The producers, plants, use the energy from the sun and materials from the environment to produce matter and energy. The herbivorous animals eat the plants. The carnivorous animals eat other animals. The omnivorous animals eat both plants and animals. Decomposers, usually microscopic organisms, decompose bodies of animals and plants thereby recycling matter into foodstuffs for plants.

FOOD CHAIN

The source of energy is the sun. A producer changes solar energy into plant material by photosynthesis. A consumer eats the plants. (Primary consumer) Another consumer eats the first consumer. (Secondary consumer)

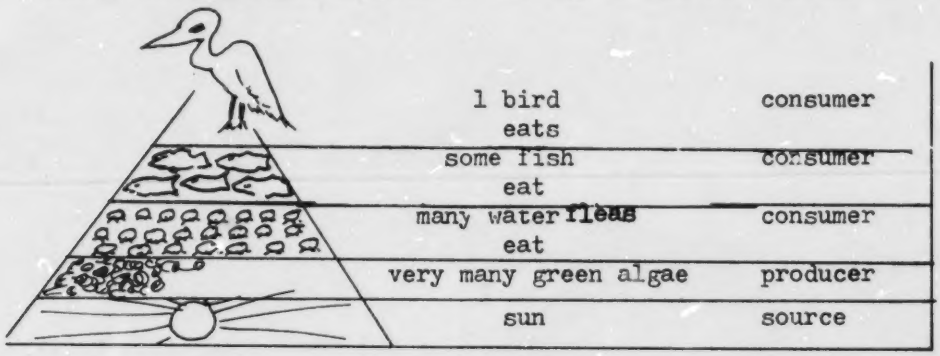
FOOD WEB

While you're sitting on the bank of the slough look carefully at what the animals are eating. Can only one kind of animal eat grass? Can only one kind of animal eat the grass eater? Food chains overlap and interconnect because most animals eat more than one kind of food. This more complicated pattern is called a food web.

Food Webs can be very complicated, for instance the heron-alligator relationship. Alligators eat the herons. However, adult herons prey on baby alligators.

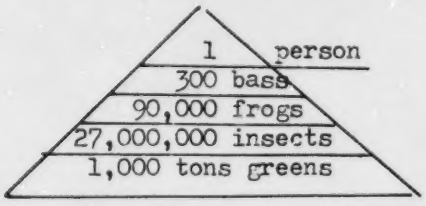
ENERGY PYRAMID

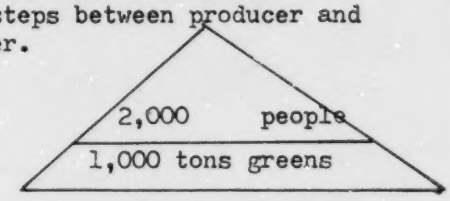
When an organism eats another it stores part of the energy and uses the rest. Only a small part of the original energy from the plants gets to the top of the food chain.



SHORT CHAINS AND LONG CHAINS

More organisms can be supported if the food chain is short. Less energy is lost if the steps between producer and ultimate consumer are fewer in number.





TROPHIC LEVEL

Each animal lives in an area that supplies its food, water, air and cover. Animals require a certain amount of food to survive. Too many animals in one area cause habitat destruction.

Animals highest on the energy pyramid require a larger area to supply their food needs than an animal lower on the chain. One eagle needs many rabbits to survive. Therefore, the area he needs as his hunting area has to be large enough to supply food for many rabbits. Trophic level refers to the amount of food required to support an animal. Naturally, animals higher on the pyramid require a greater area to supply food.

Wood storks are big eaters. During the breeding season, a period of 60-65 days, two adults and 2 young eat about 400 pounds of fish. A colony of several thousand wood storks would eat about 2 million pounds of fish during one breeding season. They cannot expend too much energy feeding themselves or bringing food back to their young, so they must take the food within a 20 mile radius of the nesting colony.

PREDATORS AND PREY

Too many people can live in an area. They just stack themselves up in apartment buildings and import food from some other less crowded area. Animals do not have that choice. No food in the area - no life.

So the number of animals in a habitat must be limited. Food needs to be reproduced faster than it is eaten or some animals will starve to death. If the problem becomes severe habitat destruction will occur and all animals will die.

One factor limiting overpopulation is predators. Too many predators, of course, would lead to starvation of the predators. Therefore, a balance is maintained in the vegetation-predator-prey relationship.

QUANTITY AND QUALITY

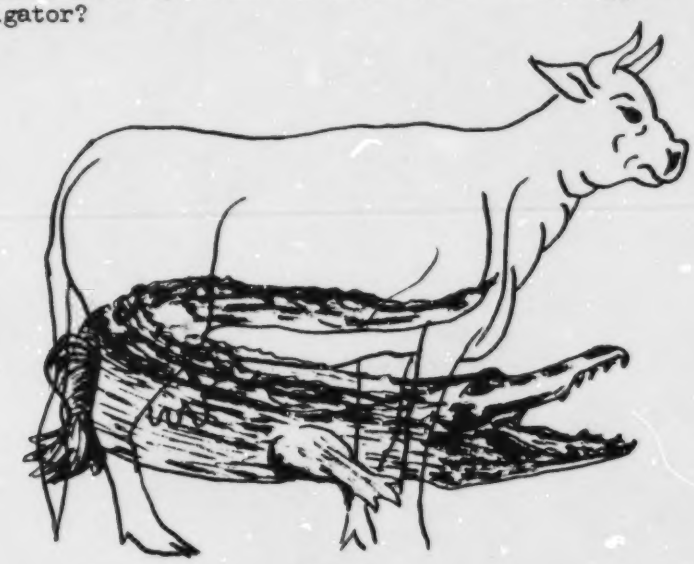
The quantity and quality of the wildlife in an area depend on the quantity and quality of resources in a habitat.

If the habitat has the environmental factors an animal requires for good health and a proper predator-prey relationship is maintained, healthy animals will continue to be reproduced.

If the quantity of resources an animal needs is not in a habitat, animals do poorly, decrease in population or die. The same applies to quality.

Example: Fish die in polluted streams. Ospreys get sick from eating poisoned fish. Foxes get sick from eating poisoned birds. Vultures get sick from eating poisoned animals.

An alligator is living in a swampy area. The area is drained to provide pasture land for cows. What happens to the alligator?



HABITAT IS THE KEY

WILDLIFE IS A PRODUCT OF ITS HABITAT

Animals depend on their habitat to supply the essentials of life. These essentials are food, water, cover, space and a certain arrangement of these essentials.

EACH HABITAT HAS A LIMITED CARRYING CAPACITY

Each habitat has just so much food, air, water, light, space, etc.

If one essential runs out that is the limiting factor in an area.

PHYSICAL FACTORS AND SOCIAL FACTORS LIMIT THE CARRYING CAPACITY OF AN AREA

Some physical factors which could determine the carrying capacity of a habitat are water, food, cover, space, temperature, soil, etc.

Animals have differing social patterns and, therefore, react differently to social conditions. Two social factors determining carrying capacity are distribution of animals and predation. If too many predators exist in an area all prey animals might be wiped out. If too many prey animals survive, overpopulation of prey animals occurs and they won't be able to find enough food.

Many animals need a certain "territory" especially during breeding season. Overcrowding causes stress and results in changes in behavior. Some animals die or fail to reproduce.
Nature produces far more than she can support.

In the absence of limiting factors animals reproduce at an astonishing rate. This is essential for the "survival-of-the fittest" law of nature. Only the strongest live to propagate.

Some animals become a source of food to others through predation and hunting. Some die because of disease, parasites, or accident. Given no other limiting factor some animals will die more painfully by starvation or from climatic conditions as droughts or storms.

REGULATIONS DO NOT INCREASE ANIMAL POPULATIONS; HABITAT IS THE KEY

The Florida panther is on the endangered species list. Therefore, let's outlaw hunting or killing of the panther so we can have more panthers. Right! Wrong! Why?

Of course there's enough rabbits around for a good food supply, enough water, air, sunshine, and cover. What's the limiting factor that is so critical that it might cause the panther to become extinct?

CONSTANT CHANGE

Wildlife populations and their environments are not static but change constantly.

EVERGLADES ECOLOGY IS BASED ON ALTERNATE PERIODS OF FLOODING AND DRYING

Remember last January. About how many days did it rain? How many days did it rain last July? Remember some years when smoke covers the city because the Everglades are burning? Remember some times when it floods?

The pendulum swings back and forth each year from flood to drought. A good condition for one species might be a disaster for another.

CHANGES AFFECT WILDLIFE DIFFERENTLY

The wading birds are dependent upon a falling water level to concentrate the millions of little fishes, shrimp and crayfish that comprise their food supply.

The Everglades Kite eats only one species of snail. High water conditions favor the snail, therefore, the kite. High water drowns and kills some trees. Kites like to nest on these dead trees.

During flood times the red-shouldered hawk eats frogs, lizards and snakes. During drought times the red-shouldered hawk changes its eating habits completely to small creatures, such as mice and insects.

Deer populations increase during years of low rainfall and dry marsh conditions. Deer losses occur during periods of above average rainfall.

Drought is a difficult time for fish. Fish populations, however, recover after drought. Eggs of the killifish stranded in soil and exposed to air, remain viable for months and hatch when the water rises above the ground.

Alligators eat large quantities of gar and catfish which enter the alligator hole as water levels drop. Alligators store up heavy layers of fat. If drought continues the alligator is safe and secure as he hides down in his den and goes through a period of estivation. During very high water times, alligator nests may be flooded.

Animals survive because each species is able to cope with flood-drought cycles even when the natural cycles are more severe.

UNNATURAL CHANGE HAS OCCURRED IN THE EVERGLADES

Man has changed water levels in the Everglades to suit his own need for farms, residences, roads and open waterways. What is good for man is not necessarily good for wildlife. Man drains off water to make the flood cycle change. Man uses up water during the dry season. Can the wildlife cope with the drastically changing conditions?

If the Everglades is dried continually it might end up as a gigantic melaleuca-myrtle forest. Consider the conditions in a dense growth of melaleuca.

If the Everglades are flooded continually it could end up as a gigantic lily pond interspersed with some sawgrass strands.

SUCCESSION OCCURS BECAUSE ENVIRONMENTAL CONDITIONS CONTINUALLY CHANGE

Lichens grow on bare ground where no plants have grown before. Lichens and mosses give way to forbes, small plants and grasses. Larger plants and sun-loving trees are now able to grow in the soil. Finally shade loving plants take over and become the dominant species. Animals find the food, water and cover they need in certain environments and not others. So as the environment and the plants change the species of animals that live in an area change to other species.

In the Everglades some sawgrass areas become hammocks. Animals that prefer sawgrass marshes move out of areas that become hammocks.

THE ENVIRONMENT CHANGES, ANIMALS MUST ADAPT IN ORDER FOR THE SPECIES TO SURVIVE

Dinosaurs didn't adapt and died; alligators did and survived. Animals best adapted to environmental conditions and to niches in each habitat survive.

Examples of adaptation: Everglades deer have a lighter body weight and a longer hind foot than other deer enabling them to run through aquatic marshes. Marsh rabbits, too, are especially adapted to live in an aquatic environment.

TEACHER GUIDE
ANIMAL WILDLIFE

This unit encourages the student to observe plants and animals and discover what is taking place in his own community.

This requires them to follow newspaper and T.V. reports concerning current legislation dealing with the local environment.

Refer to "Sources of Information" for recommended studies and activities including a quadrant study.
Answer to question 15: racoon

STUDENT ACTIVITY
ANIMAL WILDLIFE

1. Check with newspapers and publications of the Florida Game and Fresh Water Fish Commission to determine the varieties of fish and game in the Everglades which can provide food for people. Find out how many deer are born each year. Find out how many baby bass one female bass produces each year.

2. Find out the average life span of an alligator, a grasshopper or a heron.

3. Read about the environment that supported the alligator - like creature that lived in the time of the dinosaurs. How did the alligator adapt then and how does it cope with today's environment?

4. Consider the environment around the school. Invent an animal that could live in this environment. Where would it find cover? What would it eat? What water would it drink? How could it survive, given the conditions in the schoolyard? What might it look like?

5. Find out what people or groups of people are doing to improve animal habitat in your area.

6. Find out what the legislature is doing to improve habitat. What is the Florida "Endangered Species" list? What can you do in your own back yard to improve habitat for animals?

INTERDEPENDENCE

7. Draw a matter-and-energy cycle showing soil, producers, herbivorous animals, carnivorous animals, omnivorous animals and decomposers.

8. Sit on the bank of an Everglades slough(or some canal). Look around. Do you see any animals? What are most of the animals doing? How many are eating something - or at least looking around for something to eat? How many are watching carefully so they are not eaten themselves? Draw a food chain. Start with the sun - the source of energy.

STUDENT ACTIVITY
INTERDEPENDENCE

First step is a plant - a producer. Draw an animal that eats the plant - primary consumer. Draw an animal that eats the first animal - secondary consumer. Can you make the chain longer. End with a decomposer.

9. Construct a food web. A reference that might help to find out what animals eat is "What do They Eat", Florida Wildlife, Oct. 1976, pp. 18 to 22.

10. Find out how many eagles can live in a certain area. Find out how many rabbits can live in that same area.

11. Take an animal census (count the animals) in a 10 square meter area. Sometimes you cannot see animals but pay attention to signs. If you see a sign (tracks, rubbings, scat) include that animal in your census if you're sure that animals inhabits that area. Construct a food web using those animals. Describe what would happen if one of the animals in your food web disappeared from that area.

12. Take an animal census in each of these areas:
    a slough
    a sawgrass area
    inside a hammock
    on the edge of the hammock

13. Which animals are found in all areas?

14. Compare environmental factors to determine why some animals live in one area and not in another.

    Determining factors might be:
    a. temperature of air or water
    b. amount of water or moisture
    c. amount of sunlight
    d. air or water pressure
    e. soil, rocks, wind
    f. salinity of water
    g. vegetation
    h. cover
    i. presence of man

STUDENT ACTIVITY

15. What animal can live in an Everglades sawgrass area, a pine ridge, a mahogany hammock, a seashore, a park or with man in his camping areas? He loves crayfish and Oreo cookies.

16. Seven species of tiny fish supply the bulk of the food for the wading bird populations and supply forage for larger fish. These seven fish range from less than one inch to about four inches. The fish are: least killifish, mosquito fish, blue-fin killifish, flagfish, golden top-minnow, pygmy sunfish, and bluespotted sunfish. One estimate of the population in an acre of marsh is about 130,000 small fish. If the water averages about 12 inches in depth, estimate the number of these fish in 10 square feet of water. What happens to the fish when drought occurs? A fisherman wouldn't want to catch such a tiny fish, so why should he be interested in the welfare of a killifish?

17. Find a niche.
An alligator digs holes providing a reservoir of water during the dry season. The alligator eats the fish that collect in these reservoirs. However, more fish live because the alligator has provided the water hole. Birds come to the holes to feed on the concentration of fish. Alligators eat birds if they can catch them. The animals, acting in their own best interests are filling certain niches in the total environment. Report on the niche filled by one of these animals found in an Everglades environment: turkey vulture, manatee, anhinga, Zebra butterfly, marsh rabbit, osprey, Indigo snake, anole or Pomacea snail.

18. Mark off a ten-square meter area in your schoolyard or in an Everglades region. Note vegetation, water and animals in the area. Every organism fills a niche in this habitat. Do you see a grasshopper? It controls plant growth by eating plants. On the other hand it serves as dinner for a bird. In each habitat some animals serve as plant eaters and some other animal eats the plant-eaters. Describe the niche of some organisms in the marked off area. What does one of these organisms do for other organisms and what is done to it by other organisms?

STUDENT ACTIVITY

19. Mark off a ten-square meter area in your schoolyard or the Everglades. Now describe the essential environmental factors in your ten-square meter area as if you were going to sell it to an animal. (After all that's what we do when we build birdhouses.) Draw a picture labeling food, water, and cover. Measure distances between. Describe what your client could do to avoid predation. (Dogs, cats, or whatever) Describe the social situation (nearest neighbors or nearest mate) Now what animal/animals do you think would move in to your piece of real estate?

20. If your "selling" was effective in the previous question and an alligator moved in consider the following problems.

    What is the alligator going to eat? It needs water to drink and keep cool. Does it have enough? An alligator needs cover to hide from poachers and to hide when stalking prey? Is there enough?

    An alligator builds a mound of vegetation to incubate its eggs. What vegetation could it use? Would the sun shine on its nest?

    An alligator needs to dig a hole to "estivate" if the area is too dry. Can an alligator dig down to a damp area and "hole up" for a period of time?

    The biome the alligator ordinarily lives in is a sawgrass marsh. Compare your ten-square meter area to a sawgrass community.

21. Describe a good habitat for an alligator. Draw it and draw the alligator in it.
    a. An alligator female lays about 40 eggs each year. Draw all the baby alligators in your picture.
    b. The alligator female lays 40 more eggs the second year. All hatch and all live. Draw the population of your area now.
    c. Do it again to show how many alligators you would have if all the eggs hatched and all baby alligators lived the third year.

STUDENT ACTIVITY

d. By the end of the sixth year how many alligators would you have?
e. An alligator is able to reproduce at about 6 years of age. Assume half of your alligators from the first hatching are female, all lay about 40 eggs, all eggs hatch and all babies live. NOW - how many alligators do you have?
f. If each of your alligators ate 2 gar fish one day, how many gar fish would you need to feed that sixth-year population?

22. Some factors must be limiting the population expansion of alligators. What occurs in the Everglades to keep us from being buried in alligators?

23. Create a habitat in your school yard. Develop a wildlife "mini-area" in your schoolyard. Plant a thicket of shrubs and trees. Plant seed bearing plants.

24. Plant thickets of bushes near fences. Make bird feeding stations or nesting boxes.

25. Take part in a bird count or wildlife census. The Florida Audubon Society needs to know the whereabouts of wood storks (or wood ibis). A red rectangular plastic tag held by a yellow button is on the left wing. If you see a wood ibis please notify:

John C. Ogden
115 Indian Mound Trail
Tavernier, Florida 33070

26. Find out what bills in the Florida legislature and the U. S. Congress are designed to improve habitat for animals and support the bills.

VOCABULARY
ANIMAL WILDLIFE

biome - A large geographic area with somewhat uniform climatic conditions and is named for the predominant plant.

carrying capacity - the ability of a given habitat to supply food, water, cover and space to a wildlife species.

Endangered Species list - A list of animals considered in danger of becoming extinct.

estivation - the act of remaining dormant in the summer.

exotic - not natural to the environment of an area.

habitat - biotic community where an animal lives.

niche - a place and environment suitable for an animal.

organism - individual plant or animal.

predation - the act of preying on another animal or animals.

territory - an area used by an animal as its habitat.

VOCABULARY
ANIMAL WILDLIFE

adaptation	- Through evolution animals change in order to survive in a given environment.
carnivorous	- meat eaters
consumers	- organism that eat producers or other consumers
decomposers	- organism which convert dead organic materials into inorganic materials
energy pyramid	- producers produce matter and energy, consumers eat producers and in turn produce matter and energy, but in the process where some energy is lost. This pattern is called an energy pyramid
food chain	- one organism produces matter and energy and is eaten by another. This consumer may be eaten by still another making a food chain
food web	- A pattern of producer - consumer - decomposer make a complicated inter-connected pattern
herbivorous	- plant eaters
limiting factors	- If one of the necessities of life is in short supply that is the factor that limits the wildlife population
omnivorous	- plant and meat eaters
population	- the total of any given species in a described area

VOCABULARY
ANIMAL WILDLIFE

producers - an organism that is able to make its own food and is eaten by other organisms. Green plants are producers.

trophic level - One animal at one level of an energy pyramid must consume more animals from the lower level in order to survive. Each level is a trophic level. An animal in the highest level requires a large territory to hunt in.

TEACHER GUIDE
CHANGE

There is a constant change in any environment. If it were at a standstill there would be no life. It is important that the student realize that some changes are natural and that adaption must take place. This change is referred to as succession. For example after a fire, caused by lightening, destroys a vegetative area, the first plants to reestablish are the grasses, gradually building up the top-soil and laying a foundation for shrubs, followed by trees. With this change comes a comparable succession from insects to birds and small mammals to larger animals.

Man has caused many unnatural, sudden changes which many plants and animals are unable to adapt to and become extinct.

The following beaks and feet puzzle is an example of adaptation.

Answers to matching of Beaks and Feet:

1. Heron A
2. Pelican J
3. Eagle I
4. Kite K
5. Flamingo H
6. Ibis O
7. Woodpecker D
8. Spoonbill N
9. Grebe B
10. Anhinga G
11. Duck L
12. Gallinule M
13. Cormorant E
14. Cardinal P
15. Coot F
16. Vulture C

(The webbed feet L,J,G, are very similar and would fit either the pelican, duck or anhinga).

STUDENT ACTIVITIES
CHANGE

1. Survey the plants and animals in different environments to determine the changes that occur as the habitat changes.

	SAWGRASS	HAMMOCK EDGE	HAMMOCK INTERIOR
ELEVATION			
TEMPERATURE AT GROUND LEVEL			
AMOUNT OF WATER			
AMOUNT OF SUNLIGHT			
KINDS OF PLANTS			
ANIMALS			
OTHER DIFFERENCES?			

Now do the survey inside a melaleuca stand.

2. Project yourself through time to about the year 2050. If the present trend continues much of the Everglades might be covered with a melaleuca forest by 2050. What kind of adaptations would animals have to make to survive in a melaleuca forest? What kinds of animals might be able to live in the melaleuca forest? What kinds of animals would likely disappear from the Everglades? Would you like to travel in the melaleuca-glades?

3. Again go to the year 2050. Man has decided to keep much of the Everglades flooded to protect the Everglades Kite, to provide for water sports and to store water. Now what happens to the animals?

STUDENT ACTIVITIES
CHANGE

4. The Everglades ecology is based on flood-drought conditions. Man needs water constantly. Project to the year 2050. What problems are occurring? Describe how man uses water. Describe how animals use water. Describe how the decision is made as to who gets the water and when.

5. Match the beaks and feet of the birds on the next page. Certain shapes of beaks enable birds to obtain and eat certain kinds of food. Certain types of feet enable birds to move about in certain ways more efficiently or help the bird obtain or hold food. Wings, tails, feathers, nests are all certain shapes or colors depending on bird habits and habitats.

    a. Analyze the pictures of bird's feet and determine which mode of life each type of foot fits into: predatory bird, swimming bird, shore bird, perching bird, ground dwelling.
    b. Match the type of beak with the type of food: insects in tree bark, seeds, flesh, organisms in mud or shallow water, water organisms, etc.
    c. Draw shapes of bird's wings and tails and describe the reasons for the shape.
    d. Draw bird's nests and describe reasons for the style of each.

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VOCABULARY
CHANGE

adaptation - changing in structure or function for survival in a different environment

forbes - low growing herbs
Rabbits eat any kind of green plants and forbes (they even eat poison ivy)

lichens - algae and fungus growing together in a symbiotic relationship
Lichens are colorful blotches on trees in a hammock

succession - the orderly, gradual and continuous replacement of plant or animal communities by others.
The end result of succession is a climax community of plants and animals

symbiotic - a mutually beneficial relationship
Algae and fungus use each other to the benefit of both

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Florida Wildlife Federation
4080 North Haverhill Road
West Palm Beach, Florida 33407
Membership and newsletter - $10.00

Huck, Albert & Decker, Eugene Environmental Respect
Safari Club International Conservation Fund
877 S. Alvernon Way, Tucson, Ariz. 85711
or call: David Charland, Coral Springs 752-6121

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Shelia Middaugh
3301 Gun Club Road
P.O. Box V
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3994 S.W. 12 Terrace
Ft. Lauderdale, Fla. Tel 524-3125
or
Federal Game & Fresh Water Fish Commission
Information and Education Service
Lt. Robert Burleson
551 N. Military Trail, West Palm Beach, Fla. 33406
Tel: 1-800-432-2046

S.T.E.P.
Students Toward Environmental Participation
National Park Service, SE Region
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3401 Whipple Ave, Atlanta, Ga. 30344
Tel: 404 - 526-7652

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MAN AND WILDLIFE

Habitat determines wild populations.

Man alters his own environment in order to survive and be comfortable. Fish and wildlife don't have air-conditioners, water faucets, hospitals, grocery stores, etc. Fish and wildlife have to adjust to the environment as it is, or die. The degree of adaptation to conditions varies among the species. But, generally, every wild fish, bird or mammal has a comparatively narrow range of environmental elements that determines it's survival.

For example, a deer requires a combination of brushland and hammock for food and cover. What happens to the deer population if the water level in the Everglades rises so much (only a few inches is the critical difference) and drowns forested areas used by deer for bedding grounds for fawns? What happens if water levels drop those few critical inches and brush dries up?

The deer have trouble if the water level is too high but how about fish and aquatic life. How does more water affect habitat for a bass? Too little water is difficult for the bass but what happens to conditions for skunks if water is lower?

Man alters the environment to suit his own needs and purposes. Man steps in. He values certain species more than others. Below are listed some of the categories by which man determines a value. If you had to manage the wildlife for an area by controlling water level choose which animal you would provide habitat for in each category.

ACTIVITY		
Purpose	Skunk Low water	Bass High Water
1. Aesthetic reasons		
2. Commercial-economic		
3. Recreation		
4. Biological		
5. Social		
6. Scientific-philosophical		

Now defend your choice of animal for each purpose

Man's manipulations do not always have the results desired.

Some species of animals increase in population; some decrease to the point of becoming extinct. Some are protected as the kite and still the population declines. Some are purposely destroyed, as the rat, and the population increases.

O.K. So what? All the animals die. It's nice to have animals but we don't need wild animals to live, do we?

Animal mortality and natality reflect the conditions in an environment - the same environment man lives in.

a. Mortality in animals is caused by:
   - predators
   - disease in crowded situations
   - starvation
   - weather-exposure
   - accidents
   - hunting-poaching
   - parasites

b. If conditions are good natality increases because:
   - clutches/litters are bigger
   - more clutches/litters per year
   - younger breeding age
   - animals have the space, food, water and cover their species requires

c. Density of a population reflects the:
   - site of the animal
   - quality of habitat
   - cyclic nature of the population

Pesticides destroy birds. Water pollution kills fish. Forest fires destroy animal homes. Air pollution destroys animal food (plants).

If animals can't live in the environment, can man?

Would you like to take a walk in the woods and never see an animal?

Teacher Guidelines

Habitat determines wild populations.

Man alters the environment to suit his own needs and purposes.

Man's manipulations do not always have the results desired.

Animal mortality and natality reflect the conditions in an environment - the same environment man lives in.

If time is limited for the following student activities, let small groups select an investigation to research.

Groups might give oral reports on their findings or may be regrouped to form a debate team.

Then, choose an animal whose population has increased or decreased in the past 25 years in your own area.

Ask students to decide if man has helped or hindered the environment for both man and the chosen animal.

STUDENT ACTIVITIES

1. Investigate animal population increases and decreases.
   What factors are causing the decline of the kite population? What will man have to do to prevent the extinction of the kite species? What factors are causing the increase of the rat population? What factors are causing the increase of the deer population? What would man do to prevent excessive deer populations from destroying the habitat? What happened to the predators that kept deer populations in check?

2. Investigate man's "heavy hand" in the picture.
   How is man's need for cover (a house) interfering with the kites need for food? How is man's need for food enhancing the food supply for rats?

3. Complete protection is the answer???
   Investigate "Florida's Endangered Dozen". What factors have caused these species to decline in number? What could cause these species to become extinct? What could be done to increase the population of each of these species?

4. Habitat is the key!
   Make two collages. One should show the effects of a poor environment and one should show the effects of a good environment.

5. Change the water level - effect the survival rate!
   Wood storks are "grope" feeders. They find food by feel. A stork submerges its bill in water and grabs food that touches the sensitive nerve endings in its bill. Storks need huge quantities of fish and can't expend too much energy getting food. Why didn't any wood storks nest in Florida during the extreme drought of 1961? During unusually heavy rainy seasons wood storks might leave nesting areas. More water and the fish spread out. How does this effect stork's food supply?

6. Pollutants destroy!
   Some animal species, which have extremely high birth rates as a cockroach, are able to develop immunity to some pollutants (as insecticides). Ospreys produce fewer young each nesting period and are not able to build up natural immunity.
   Make a report on effects of pollutants on animals in the Everglades.

VOCABULARY

density - number of anything per unit area
Density of animals per square miles was determined by counting from an airplane

mortality - frequency of death
Mortality rates increase when habitat is polluted

natality - birth rate
Good habitat leads to a raise in natality rate

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Wildlife, the Environmental Barometer
This brochure is published by the Wildlife Management Institute,
709 Wire Building,
Washington, D.C., 20005

NIGHT LIFE

Nighttime. People go in. Animals come out. Many animals wait for the safety and coolness of night to scurry about in search of food.

No, their eyes aren't necessarily better than yours, but they have become acclimated to moving around in the limited light of night. So can you, if you want to enjoy the special world of the nighttime creatures.

Take a walk at night - start with short walks. As you become more accustomed to finding your way make longer trips into wilder areas.

Helpful Hints

1. Move about slowly and carefully. Note landmarks to prevent getting lost. Don't panic if you get lost. Don't run. Stay in one place until daylight.

2. Wear comfortable, warm, dark clothing. Wear high-topped shoes or boots, well greased against the wet, and jeans as protection against insect or snake bites.

3. Bring a flashlight - preferably one you can attach to a hat. Put a piece of red plastic over the light. A red light is less alarming to some animals and not seen by others.

4. Rub your clothes with strong smelling leaves to avoid being sensed by animals.

5. Tell someone where you're going and about when you plan to return. Go in very small, quiet groups or alone.

6. Avoid dangerous areas. Scout areas during the day and avoid dangerous areas.

7. Move slowly. Poisonous snakes usually want to avoid you, so give them time to move away. Watch where you put your hands or where you step.

Most nights, even moonless nights, have enough light from stars to enable people to move about slowly. It takes from one-half hour to three-quarters of an hour for the eyes to adjust and work effectively at night.

One aid available, is a red-covered flashlight. Most animals that travel at night have eyes which are not color sensitive. Putting a red plastic screen on a flashlight or car light would enable exploration at night. Some animals which move about both in the day time and at night would notice a red light but would be less frightened. Fastening the light to your head leaves your hands free. MOVE QUIETLY. Sit or stand for long periods of time.

Settin' an' watchin'. Choose a comfortable place to sit some evening in the out-of-doors. Settle down and sit without moving at all for an hour or so. Animals, insects, birds, etc. will go about their activities without noticing you if you remain absolutely still. A neat place to be, is a pond adjacent to a wooded area. You can see several habitats at once. You can watch the reflections of trees. The shimmering beauty of the water is enchanting when the moon comes up.

Listen for: the swish of a wing, the croak of a frog, the snap of a jaw, the call of a night bird, a splash and more.

Helpful Hints

1. Use wide-angled binoculars.

2. Hide in a blind covered with mosquito netting and disguised with branches.

3. Wear dark clothes.

4. Smudge your face with charcoal.

Some tiny creatures glow at night. A pair of gleaming spots could mean the eyes of a wild creature reflecting the light of the moon or a flashlight.

NIGHT FLYING BIRDS

Spot birds silhouetted against the moon. Most birds migrate at fairly low altitudes so watch at time when the moon is still low in the sky.

Know the flight patterns of birds in a group who might be migrating through the area. Know the flight pattern of birds that fly in the late evening seeking food.

FINDING MAMMALS

Mammals are creatures of habit. So find out about the habits of animals that might be in the area you wish to explore. During the day look for trails, droppings, tracks, rubbing spots, etc. Know what animals have homes in the area.

Study the silhouette of animals. Note particularly the length and shape of ears, nose and tail. To help identify an animal at night study the pattern of movement (swift, jerky, fluid, secretive, etc.) Some animals make a great deal of noise as they move through the underbrush, as the armadillo.

Use the red light to identify the animal behind the shining eyes. Red light cannot be seen by nocturnal animals and other animals fear the red light less.

WATCHING FISH AT NIGHT

Use a powerful, waterproof flashlight. Attach the flashlight to an anchor or rock in the bottom of a stream or pond in a stationary position, with the light directed upward. Fish, like moths, are curious creatures and will come swarming around the light as long as it stays steady. Quick movement frightens animals. All sorts of underwater creatures might come to investigate. Smart, big fish will take advantage of the situation and gobble up smaller creatures. Smart small creatures will avoid enemies.

Cover the flashlight with red plastic, if you want to watch a more natural situation. Animals that move around mainly at night won't see the light.

For clearer visibility make a glass-bottomed box and fasten the light to shine down into the depths. Submerge the box so the bottom is a few inches beneath the water surface and you can see with clarity.

LOOKING FOR INSECTS

A red-covered flashlight is the key to revealing the night life of insects. But you have to look very closely. Scrounge down amongst the grasses and flash the red light around.

Or fix dinner for the insects. During the day paint a sweet mixture of beer and molasses on leaves or bark. Move in quietly at night. Look especially for lots of life on a moist, warm night with a hint of a storm.

Or fix a light. Turn on any outside light of your home and watch the myriad of insects that flock around a light at night.

Or find some night-blooming flowers and watch insects come to them. Look for night-blooming cereus.

Or look in a pool. Some insects can be seen swimming in pools or crawling on the bottom.

Or look for a flash. Some insects flash their own light or glow.

BE IN TUNE

The animals that move about at night communicate by sounds and by using the sense of smell.

Be in tune. Turn off your flashlight; turn on your ears and your nose. Listen for the quiet, but powerful beat of the owl's wing. (Can you describe the sound of the wind in a pine tree, in a palm tree?)

To increase your sense of smell wet your nose or go out on a damp night. Put your nose low to the ground. Night breezes pick up scents close to the earth.

TEACHER GUIDE
NIGHT LIFE

Night time is a scary time for some people. For animals, darkness is security. Walking at night near a woods or near water has special rewards.

Gently introducing people to walking around at night can lead to some specially memorable experiences.

Follow safety rules to avoid unhappy experiences.

Some hints are given to make night time explorations more productive.

Start with short walks of short duration. When you or the students are more comfortable break up into smaller groups and go further.

Enjoy the silence and the new experiences.

There are many animals,birds and insects that can be investigated by students in their own yards, even with street lights.

Establish a contest for the best or greatest number of silhouettes each student can present from their backyard watching.

STUDENT ACTIVITIES
NIGHT LIFE

1. Draw the silhouette of the following animals or of some animal you have seen in the dark.
   Raccoon, fox, armadillo, rat, bass, bream, alligator, skunk, nighthawk.

2. Tonight take a walk after dark near your home. Describe the animals you see. Describe the feeding pattern of any birds you see (or bats). What animals do you see around street lights?

3. Take a flashlight and look down close to the earth in your front yard after dark. What insects did you see?

4. Listen each night at the same time of night for the sounds you hear. Identify the source of the sound. You might have to wait until next day.

5. Take a night walk in (1) a wooded area, (2) near a canal, (3) in a pine area, (4) in a cypress area. Go about the same time each night and for about the same length of time.
   List the animals, animal activities, sounds and describe the smells in each area.

VOCABULARY

migrate - to go from one region to another with the change in the seasons

nocturnal - active in the night

rubbings - places where animals rub against to scratch themselves

silhouette - a dark image as a shadow in profile, outlined against a lighter background

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TRACKS

A "printed" story.

You can read a story from a track when you can figure out what animal left the print, how big the animal was, how fast it was going, what direction it went, what it ate, if it was traveling alone, and, even, if it was hungry. Those facts can be gotten by expertly "reading" signs.

A hunter tells this story: He was traveling along the foothills in Wyoming when he came across the tracks of a jackrabbit. He read this story from the tracks. The animal had been in a desperate hurry. The rabbit tracks were joined by those of a coyote. The rabbit had dodged sharply and quickly. The coyote was no expert in taking turns. Time and again the rabbit turned swiftly to successfully elude the coyote. It looked good for the rabbit until a third set of tracks joined the scene. A second coyote, from further up the hill came diagonally down the hill in long leaping bounds. At the point where the rabbit made a sharp uphill turn several drops of blood could be seen. Two coyote trails led off together up the hill.

Look for signs.

Look sharply. Tracks can be easily seen in sandy automobile roads. Along the shore line of ponds, tracks are clearly visible. Look up in and on trees for signs. Look for disturbed places where animals scratched, dug or rubbed.

Some techniques to enable you to be an expert tracker:

1. Fix the details of a single track in your mind. Draw a notebook sketch.

2. Walk into the sun. The sun will cause small details to cast shadows making the track clearer. If you are following the track with the sun at your back glance back to take advantage of shadows.

3. Look at the tracks as a whole. Let your eyes sweep ahead from time to time. Look for other signs, too. Bent grasses reflect sun differently.

4. Imagine yourself in the place of the animal you are tracking. If the tracks fade out try to figure out where an animal might have gone. (Would he go right through thick underbrush or around it?)

To "read" the track answer the following questions:

1. Did the animal have hoofs, paws, toes, claws or a draggy tail?

2. How big and how deep are the tracks? How far apart are the tracks and are they in a straight line? A zig-zag?

3. What are the other signs? Burrows? Gnawings? Scat? Feathers or fur? Pellets? Diggings? Tunnels?

If you have those answers complied in your notebook along with a sketch you can analyze your data and decide on the animal who left the print when you check with reference books later on.

Animals with hoofs.

To determine what hoofed animal crosses your path you need to know which animals would likely be in the area. Is it a place where cattle might frequent? Note the shape. What is the difference in shape between a pig and a deer? What is the difference in the dewclaws in the track of a deer and in the track of a wild boar or pig? Which would disturb the ground by rooting for food? Which have separated hoofs and which have a hoof that is one solid outline? Which animal would rub against a tree at the higher level? Could you tell the difference if you saw some hair left in the mud or dust when the animal rolled? Hoofed animals make zig-zag tracks. In galloping hind feet and fore feet come down in paired tracks.

DEER - The whitetailed deer and the Key deer have similar tracks but the Key deer tracks are much smaller. The track tends to have a heart-shaped appearance but sometimes the toes are separated. In the front track the dewclaws are close to the hoofs. In the hind track the dewclaws are farther from the hoofs.

COW - The track is larger and more blocked. A calf track is more pointed than a cow track but still it is larger than a deer.

PIG OR WILD BOAR - Domestic pigs and wild boar tracks are more rounded than those of deer. The pig and boar declaws are more pointed and extend farther out to the side. A wild boar has a narrower hoof and longer legs and strides than a domestic, fatter pig. The hind feet are slightly smaller than

the front feet. Dewclaws of the front feet usually show in the track but seldom do the dewclaws of the hind feet. In a trot the hind feet are placed in, or partly over, the print of the front feet. Both the wild animals and the domestic pigs root up the earth looking for food and wallow in wet, muddy places. The wild boar rubs trunks of trees and gouges them with his tusks.

HORSE - A shod animal leaves an obvious track. An unshod animal has a single round or oval hoofprint with the "V" mark of the frog in the middle.

Animals with paws.

OPPOSSUM - Note the peculiar hind foot. Where does the "big toe" point? How many toes? Might you see a dragging tail pattern?

ARMADILLO - How many toes on the front foot? How many on the hind foot? If the animal rested might the hard shell leave a print? Since it is an efficient digger it can excavate many burrows. The length of a burrow might be two to fifteen feet, the diameter might be seven to eight inches. It digs and roots for insects and excavates ant hills for food.

RACCOON - The tracks tend to be plantigrade and seem hand-like. It has five toes on front and hind feet. Raccoon track are usually paired. The left hind foot is placed beside the right forefoot as the animal walks along. A raccoon leaves claw scratches as it climbs a tree to its hole.

OTTER - Otters have slender bodies and short legs and move in bounds or jumps in an up-and-down snake like motion. The hind feet come up close to the forefeet which are then thrust forward together. When the animal walks the hind feet prints fall right behind the forefeet prints though sometimes the hind feet come exactly in the prints of the forefeet. When the animal runs the paired prints of the hind feet fall in front of the forefeet prints. Look for signs of an otter slide. Otters love to frolic in and near water.

SKUNK - Because a skunk has a formidable defense weapon - a smelly spray - it doesn't need to run swiftly. They waddle along on short legs with the hind feet pointing inward and

all four feet showing separate imprints. When they run the fore feet and hind feet are in paired tracks. A skunk digs after insects and grubs. It leaves little "pits" which are hard to recognize.

DOGS - Generally, dogs walk in zig-zag wandering patterns. Wild animals are more businesslike and their paths are more direct. A dog's heel pads of front and hind feet have distinctive outlines. The toes on the front feet tend to spread more.

RED FOX - The trail of the red fox is a line of dainty footprints in an almost straight line. The hind foot is more pointed than the fore foot. Distinctive markings can be seen in a very clear print. The heel pad has a transverse, arched, raised bar protuding from the hair of the foot.

CAT - Cats usually keep their claws retracted. The heel pads appear relatively larger. The toes tend to be arranged somewhat as a curved row in front of the large pad. Cat tracks show two lobs, dog tracks don't. Domestic cat tracks are smaller than bobcat tracks. Bobcat tracks are smaller than panthers. Look for claw marks on trees where cats scratched. All cats bury their droppings, or scats, so note any signs of scratched up earth.

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Note: Long legs or short legs? Animals with comparatively long legs of about equal length usually place their hind feet in the tracks of the fore feet when walking. Domestic cats and wild cats are examples. (No claw marks show.) Members of the dog family have the same pattern, however, claw marks show. Hoofed animals, too, leave that pattern.

Rabbits and squirrels have long hind legs but short front legs. They move in jumps or leaps. You would see four separate prints.

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Rodent tracks.

Rodents gnaw or live on vegetation. Some are large, as the beaver, many are tiny creatures like mice.

GRAY SQUIRREL - In the first place these tracks would likely be found near trees - not in open fields. Patterns of tracks are varied. The heel of the front foot does not always leave a mark.

RAT - The Florida water rat looks like a huge field mouse. Look for tracks around water. Its house looks like a stack of vegetation one to two feet in diameter. No mud is used in construction. Look for runways and tunnels. A cotton rat makes a similar track and also develops a runway and makes a home of grass or leaves but it is found on drier ground.

MOUSE - Many species of mice roam the field and forest. Animals may be five inches to ten inches in length. Mice travel fast - they scurry and leap. Mice are grasseaters and collect little piles of cut grass. Look for runways.

RABBIT - Marsh rabbits prefer to live in wet land and will swim to escape danger. Rabbits hide in thickets and briar patches, hollow logs, burrows and even climb short distances to enter tree holes. The marsh rabbit may hide in clumps of floating vegetation. Tracks of rabbits and squirrels look about the same. The rabbit places its forefeet one behind the other - the squirrel side by side. They move in jumps using the front legs as balancers and the hind legs for getting ahead.

Birds

Bird groups leave a particular pattern of track, but determining exact species should be left to observation of the bird itself.

PERCHING BIRDS - Birds, like sparrow, which spend most of their time in trees usually hop when on the ground so the tracks appear paired. The tracks are parallel.

SWIMMING BIRDS - Look for webbed feet and an alternate print pattern.

WADING BIRDS - Long spreading toes help them walk and balance.

GAME BIRDS - Game birds and birds that spend much time on the ground as robins do run or walk. The tracks alternate.

BIRDS OF PREY - Look for thick toe marks with claws. Other signs to watch out for, include castings. Often a species of owl can be identified for examining castings.

TREE MARKINGS - The pileated woodpeckers generally leave elongated borings with squared off ends. Very frequent markings indicate sapsuckers at work (makes the tree look like a sieve.)

AMPHIBIANS AND REPTILES

FLORIDA GOPHER TORTOISE - This animal digs a burrow many feet long, with an opening as much as 8-12 inches long.

INSECTS AND OTHER INVERTEBRATES

Look for tracks, raised ridges, rope-like tubes. The fine traceries left in sand could be left by many kinds of insects. Look for the signs of insects at work. Pull of the bark of a dead tree and note the burrowings.

CATERPILLARS - Caterpillars chew up leaves and leave tiny droppings about the size of grass seed. Look for little drops of pitch on conifer bark.

OTHER SIGNS - Sawdust indicates an insect was busy. After a heavy rainfall earthworms leave a network of trails. Some insects shed skins. Look for galls, caccoons and eggs.

LIGHTNING TRAILS

Careful observation can tell you if fire burns an area. How high on the trees are the charred marks? The size of the present undergrowth will tell you how long ago the area burned. Lightning leaves a mark - a tree with a burned out top or a split branch.

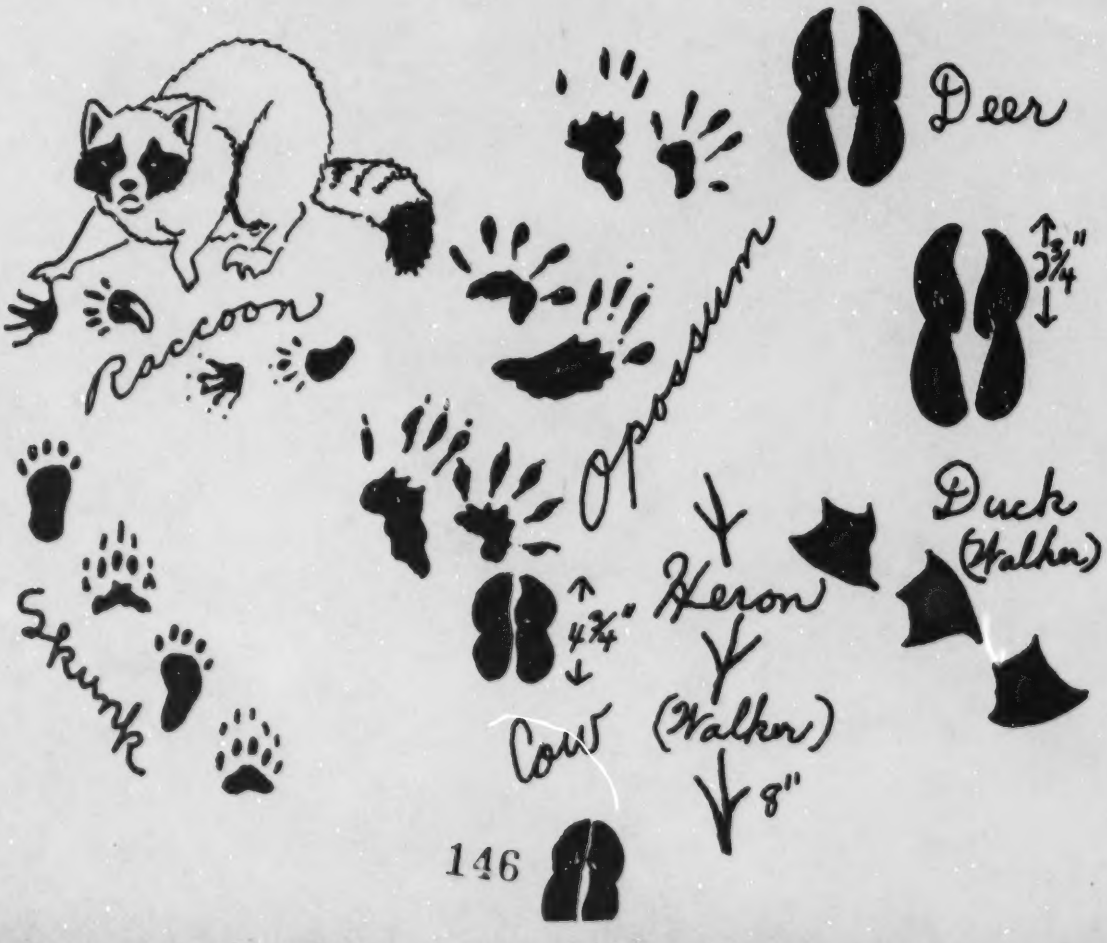
PEOPLE TRACKS

After studying your own tracks you will be able to determine many things from footprints left by people.

However, people leave other evidence of their presence - other evidence besides beer cans and gum wrappers that is. Painted markings are left on trees to mark well used trails. Many times blaze marks are left to mark a trail. A chop with an ax leaves a mark on a tree. Each traveler used to leave his own particular mark. That's not so practical anymore. Too many people - too many marks. Leave stone pebble arrows to mark a trail. How would you mark a trail without causing damage?

Study your own track. Is it a straight line? One foot behind the other? Is one part deeper? Measure the space between tracks when you are walking and when you are running. How do the heel and toe tracks differ when you walk and when you run? How is your track different from someone else's? How is your track different when you are hurrying home to supper (when you are hungry) and when you are wandering on the beach?

Can you read a story in your tracks? Did you take off your shoes? Run after a friend? Kick a football? Limp? Get wet? Walk backward? Carry something heavy?



TEACHER GUIDE
TRACKING

Careful observation of small details permits an experienced tracker to know that animals inhabit an area even though no animals can be seen.

An expert tracker can tell size, species, condition and speed of the animal that made a track.

Other signs to look for are: scats, casting, runways, disturbed vegetation, claw marks, teeth marks, food reserves, homes, feathers, and fur. For instance, some cat-like animals, like the bob cat, will bury their excretions, just like the house cat. Some, like the skunk who search for grubs, leave little holes or diggings.

Tracking requires close observation of any disturbance in the area. A good time to find the best signs are early in the morning before people have erased these signs. (A dirt road or path after a night rain). Look in the school yard in an area that is barren and sandy. The most inexperienced tracker can generally find a centipede or snake track.
Answer to question #4: osterich

STUDENT ACTIVITIES

1. To bring back samples of tracks for identification you might make a plaster cast. Be a track detective.
   Reference: Boy Scout Handbook

2. Scats help identify animals.
   Reference: Field Guide to Animal Tracks

3. Find out what animals live in an area. Find out the record sizes for some of the animals.
   Reference: Broward County Parks Dept.
   Game and Freshwater Fish Commission

4. What made these tracks?
   They were found in north Florida.

Answer: "Those Mystery Tracks"in Fla. Wildlife, May-June, 1977 Vol. 31.,#1

5. Take a look at tracks near your home. Record in a notebook the information you would need to identify the animal that made the track. How large are the individual tracks? How far apart are the tracks? Do the tracks follow in parallel fashion, alternate, or other pattern? How wide apart are the tracks (is it a fat animal or a thin animal)? Do the toes point in, or out, or straight ahead? Do the tracks show hoofs, toes, claws, or what? What other signs do you see? What "story" can you read from the tracks?

VOCABULARY

Castings - Pellets dropped by owls.
Owls throw up parts of animals that are not digested as castings

Dewclaws - the false hoof of deer, hogs, etc.
Dewclaw marks help identify deer and hog tracks.

Plantigrade - Flat-footed
A raccoon leaves a plantigrade track

Runways - Trails
Rabbits, mice and rats have runways between home and food supply.

Scats - Droppings
Examination of scats helps identify the diet of the animal

Traces - A track or sign left by a person or animal.
The beetle left traces of its passage over the sand.

REFERENCES

Murie, Olaus. A Field Guide to Animal Tracks. Houghton Mifflin Co., Boston, 1954

Ormond, Clyde. How to Track and Find Game. Outdoor Life, Funk & Wagnals, N.Y., 1975

West, James. Scout Field Book

OUTDOOR RECREATION

Outdoor recreation programs are carried out at both state and federal levels, through parks, forests and wildlife areas. Regional districts created by law to carry out certain resource development projects, such as the WMD, can be made to serve related outdoor recreational purposes. Major works of the WMD Project include the three Conservation Areas. Its policy is to make its land and water areas available for public outdoor recreation to the extent legally permissible and consistent with operation and maintenance requirements.

Resource-based outdoor recreation is dependent upon some element of the state's natural resources. Such activities are picnicking, fishing, boating, nature study, camping, hunting and target shooting. Various Agencies work in conjunction with the WMD in the three Conservation Areas to maintain and regulate these activities. In Conservation Area I, the U. S. Fish and Wildlife Services control the Loxahatchee National Wildlife Reserve. In Conservation Areas II and III, the State Game and Fresh Water Fish Commission, control the Everglades Wildlife Management area.

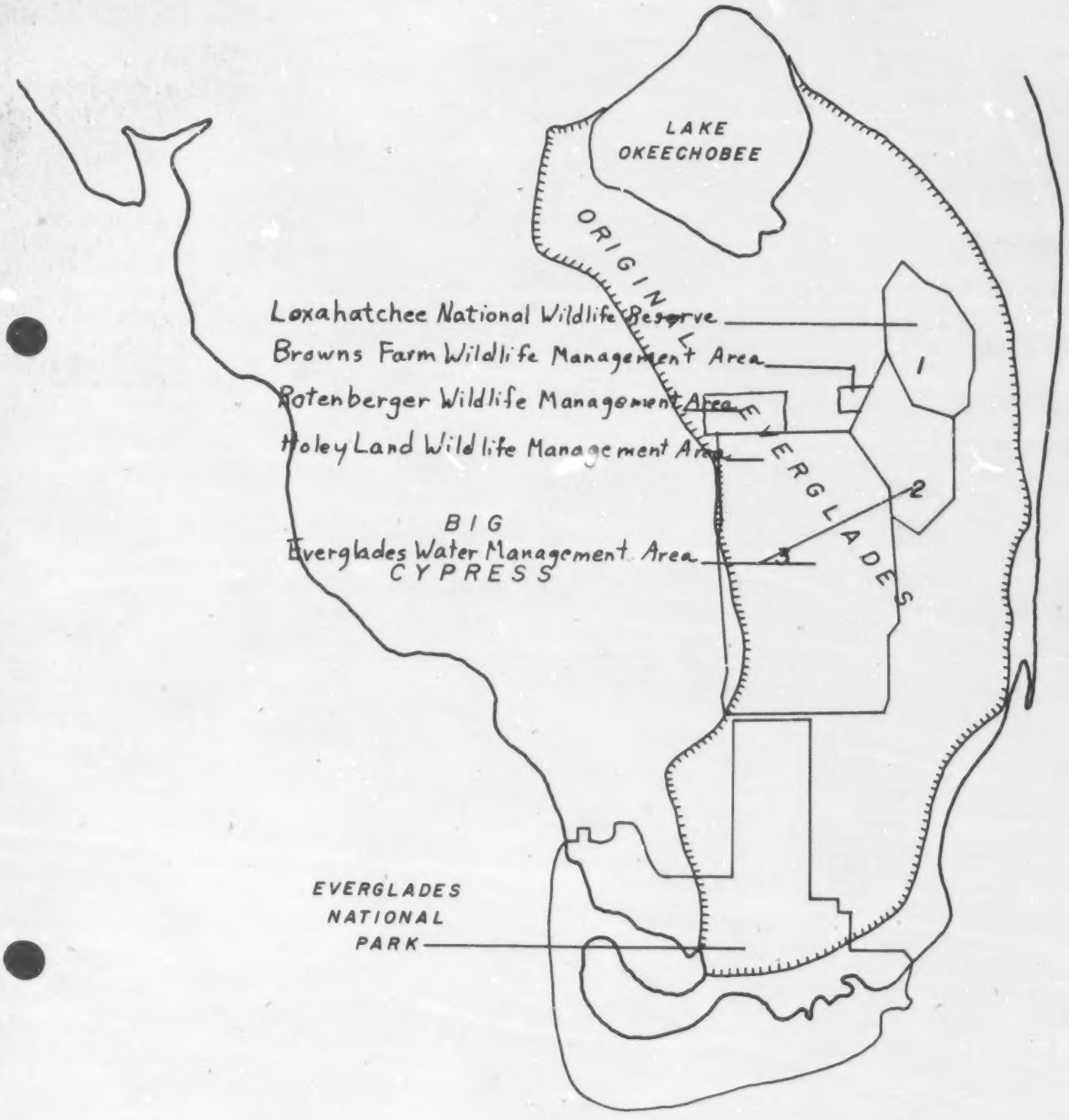
Plans for outdoor recreation are carefully coordinated with not only state programs but also with federal and local programs. Programs at all governmental levels are basically similar and have essentially the same objective.

WHAT IS A CONSERVATION AREA?

In its original state, the region known as the Everglades comprised one of the largest freshwater marshes on the North American continent. Today, approximately 50 percent of this area is being preserved in a more or less natural state in three Conservation Areas and in Everglades National Park. (the third largest national park in the country) Undeveloped Glades in both public and private ownership still remain outside these areas but most have been developed for agricultural purposes. Some of this acreage has given way to residential development as a result of westward expansion along the east coast.

In 1948, Congress authorized the joint federal-state control, primarily to receive floodwaters from adjacent areas and store them for beneficial municipal, urban, and agricultural uses. Construction for the encircling levees began in 1949 and the three storage areas became functional in 1962.

Water Conservation Areas 1, 2, and 3 include approximately 1,345 square miles of Everglades; the greater portion lies in the western half of Broward County. (See the Everglades map.) The Central and Southern Florida Water Management District (WMD) has the responsibility for maintaining the conservation area canals, levees, water control structures and pumping stations; releasing water to meet municipal, urban and agricultural needs along the east coast.



CONSERVATION AREAS
OF
THE EVERGLADES

FISHING

All Florida fresh-water fisherman except residents 65 years of age and over and children under 15, must possess a fishing license. No license shall be required of any resident when fishing in his county of residence - with not more than three cane poles or lines except in Fish Management Areas. Resident servicemen on leave do not need a license. Information regarding the Everglades Region can be obtained from:

Everglades Region
551 N. Military Trail
West Palm Beach, Fla. 33406
Tel: 1-305-683-0748
1-800-432-2046

Licenses are issued from the offices of tax collectors and their sub-agents. General fishing regulations and annual licenses are in effect from July 1 through June 30, of each year. The enjoyable relaxation of fishing has been one of Florida's foremost attractions. You can fish 24 hours a day and every day. There are few exceptions regarding size limit on fresh water fish.

For Broward County, refer to Florida's Fish Management Areas Rules and Regulations, information available at local Game and Fresh Water Commission offices. Bag limits are required for specified species.

Fishing is probably the country's most popular sport, however, few amateur fisherman understand the effects of specific temperatures, depth, speed of water flow, lures and food requirements of a particular species.

Florida fresh-water fishing is a year-round sport. Fish can be caught in lakes, canals or streams. Certain fish favor fast flowing streams, while others prefer lakes, ponds, or swampy areas. Generally bass, panfish, pickerel, catfish or gar can be caught in specific habitates. A good knowledge of habitat and preference of each species, can make a good, successful fisherman.,i.e. Everglades Region - Tigertail Lake, Broward County for channel catfish.

ANGLER ETHICS

DO NOT DISTURB A FISHERMAN whether he is successful or not. The first fisherman on a particular spot has the moral right to fish without disturbance. Respect this right.

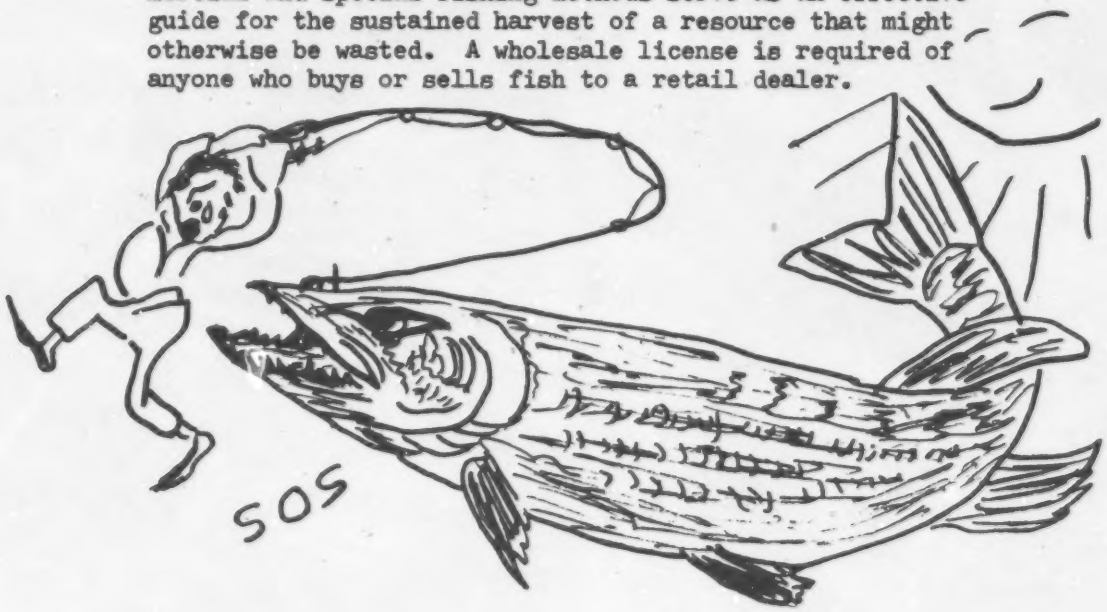
If fishing from a boat, observe the extent of lines; do not cause discomfort from your boat wake.

Do not litter! Even though most rubbish sinks to the bottom of a stream or pond, much of our waste destroys the habitat for future fish populations.

Be sure to reserve the right for others to come to the same area to fish successfully.

COMMERCIAL FISHING

Commercial fishing licenses are issued only by the Game and Fresh Water Fish Commission. Rules governing commercial and special fishing methods serve as an effective guide for the sustained harvest of a resource that might otherwise be wasted. A wholesale license is required of anyone who buys or sells fish to a retail dealer.



STUDENT ACTIVITY

1. Select a species of fish

   a) What is the typical food source?

   b) Do they prefer cool or warm water?

   c) Where is their general food source availab e?
   (stream, lake, fast moving water)

   d) What time of day do the fish generally feed?

   e) Following your research, try out your findings
   to see if they really work.

   f) Collect newspaper articles regarding unusual
   or record fish catches.

   g) What are their natural enemies?

How Does Hunting Fit Into The Picture?

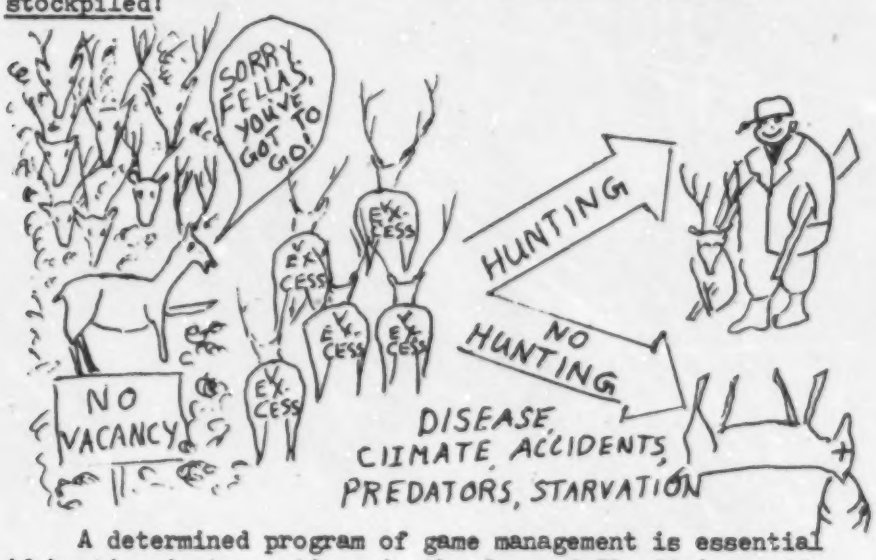
A description of an environment will predict specific types of resident or migratory wildlife. The biome of the Conservation Areas include the sawgrass, wet prairie, slough aquatic and tree island communities. These are the home for numerous species of mammals, birds, reptiles and amphibians. White-tailed deer, waterfowl, snipe, rabbit, wild hog, constitute the important hunting resource. The dominant plant determines the habitat for wildlife.

Each unit of habitat has precise limitations and boundaries and has limited carrying capacity, varying day to day and season to season. Essentials of each habitat include water, food, cover and space. Each species has its own measurement of distance. Consider, if, in our community, we moved all bathrooms to the farthest north edge of town; all bedrooms to the extreme south, how many people could live there?

Distribution is important. Due to environmental changes, wildlife populations are in constant change. All wildlife have specific living requirements, interdependent with their environments. Living things tend to produce more of themselves than their habitat can support, given sufficient natural resources. Natural resources can be

managed to extend their value. A certain part of wildlife populations can be annually harvested without damage to the resource.

Harvesting an annual surplus of wildlife can be an important part of management. Large herbivores have the capacity to destroy their habitat when populations increase beyond the carrying capacity of the range. Varying climatic conditions can vary from year to year, influencing the carrying capacity of a given species. Some species, such as the white-tailed deer, have a tremendous reproductive potential. Man can well afford to harvest a share of this annual mortality, rather than letting disease, starvation, accident, etc., take their toll. Wildlife cannot be stockpiled!



A determined program of game management is essential if hunting is to continue in the face of Florida's rapid urbanization. Hunting is the most demanding of all outdoor recreational activities.

LICENSE REQUIREMENTS

All hunters must posses a hunting license, except children under 15 and Florida residents age 65 and older.

Special permits are required for hunting in a Conservation Area, in addition to a State Hunting License. First, the hunter should become familiar with the "Florida's Hunting Handbook", and then investigate further the specific requirements within management areas such as: Brown's Farm; Big Cypress North; Big Cypress South; Everglades; Holey Land; J. W. Corbett for the area he wants to hunt. In addition to a hunting license and Wildlife Management Area stamp, a hunter is required to obtain a Quota Hunt Permit to hunt on Wildlife Management Areas during the first nine days of the open hunting season. Archery, muzzleloader or primitive-weapon hunting requires a permit. Both the special hunt and area quota hunt applications must be made by mail and are issued on a first-come basis. Yearly quotas apply to the number of permits issued. Maps and applications may be obtained from your tax collector or license agent or from any office of the Game and Fresh Water Fish Commission.

In addition to special permits in Conservation Areas, hunting is permitted on privately owned land with the owner's permission.

Migratory game requires a special stamp.

NON-LICENSED HUNTING

Frogs and turtles may be taken throughout the year without a license. However, there are restrictions regarding the methods used to hunt.

HUNTER SAFETY

Hunter Safety programs and safe usage of firearms are generally dispensed through local clubs. For information regarding available programs contact:

Jim Truitt, Hunter Safety Coordinator
Everglades Region
551 North Military Trail
West Palm Beach, Florida 33406
Tel: 683-0748

ONLY IMPROPERLY HANDLED GUNS ARE DANGEROUS, BUT ANY IMPROPERLY HANDLED GUN CAN KILL!

Almost 60 percent of gun casualties are caused by persons under the age of 21. Surveys show firearms are present in over 75 percent of homes in the United States. Over 70 percent of firearm deaths occur in the home. Therefore, all persons handling guns, including BB or air guns, should fully investigate safe handling methods before operating or handling such weapons.

The use for any purpose of BB guns, air or gas operated gun by any child under 16 years of age is prohibited unless under the supervision and in the presence of an adult.

HUNTER ETHICS

Certain responsibilities are assessed to the sport of hunting. Important aspects are an understanding of wildlife management, game laws and sporting codes. A true sportsman must obey the unwritten or moral laws as well as the written ones, based on biological knowledge and man's activities affecting wildlife. He must consider the whole picture involving the entire biota.

Teacher Guidelines

Plan a debate, following research, in favor of supporting hunting vs. prohibition of hunting. Both opinions are common within society today, and usually based on good reasons. Select students who have a preconceived idea and encourage them to research facts for presentation of their view. Include people that have mixed emotions. Allow 3 or 4 minutes for each side to present their reasons. Invite non-biased people to judge the effectiveness and qualifying statements of each group.

FOLLOW-UP QUESTIONNAIRE

For all students regardless of opinion.

1. What are the problems usually associated with arguments such as this one?
2. List three examples of other arguments that created problems such as this.
3. How can one avoid getting involved in an emotional or irrational argument?
4. What is the basis for the hunting controversy?
5. Do you think the hunting controversy will ever be resolved? Why or why not? If so, how might it be?
   Have all participants consider the source of their current food supply (steak, chicken, pork chops etc.)
6. How does killing of commercial animals differ from game killing?

Reference: Environmental Respect
Albert R. Huck and Eugene Decker
Safari Club International Conservation Fund
PO Box 7028,Ft. Lauderdale,Fla.33338 Tel. 524-5321
Simulation Game: Pp 88-91

Many people get involved in emotional or defensive reactions when they do not clearly understand the nature of either position.

"State Game Laws"

VOCABULARY

Biome -- classification of an area according to the dominant species
Biota -- all of the plants and animals in an environment
Carrying capacity -- the number of each wildlife species the habitat can support without damage to either the animals or plant habitat
Conservation -- wise, controlled use of an area
Edge effect -- the tendency of most wildlife to concentrate at the edge of two adjacent vegetative types i.e. food - shelter areas
Exotic -- species not native to an area
Herbivore - plant eater
Hunting -- a management tool to remove some of the excess animals in a population without damaging the breeding stock
Preservation -- non-use of an area
Resident of Florida -- citizen who has resided continuously in the state for one year and in a particular county for at least six months
Stockpiling -- an overgrowth of a species
Wildlife management -- the science of managing wildlife and its habitat, including man, for the benefit of the entire biota

RULES OF THE ROAD FOR
FUN IN FLORIDA

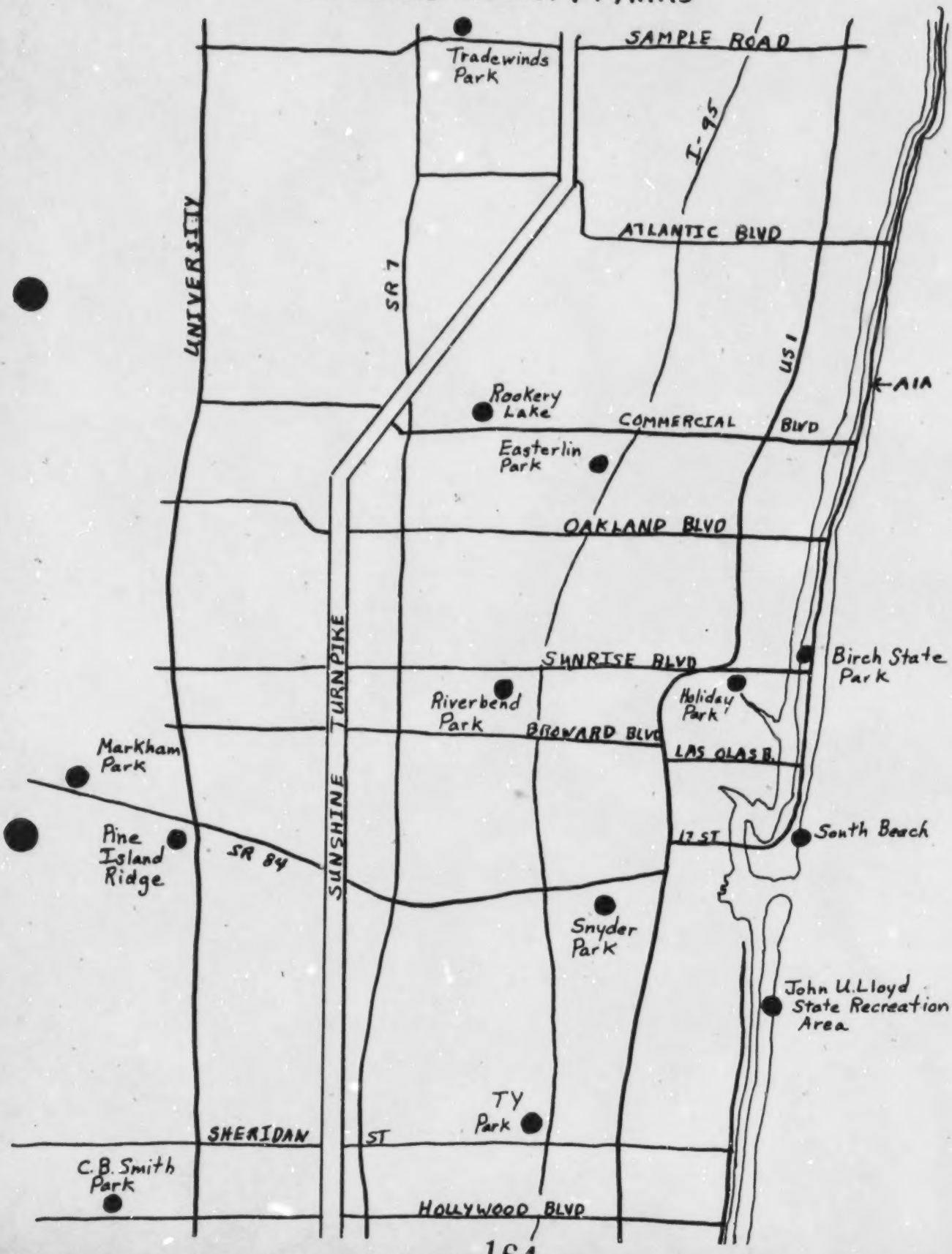
Some excellent books, pamphlets, etc. are listed in the references for outdoor activities. Following are a few ideas to keep in mind to make your outdoor experience memorable for its pleasures:

For Backpacking:
a. The slowest person in the group should go first to avoid having a straggler fall far behind.
b. Plan short walks at first.
c. Don't go hike alone. Ask a friend; in case of emergency one of you can go for help.
d. Tell someone your plans, where you're going and when you're planning to return.
e. All drinking water obtained "on site" in Florida should be purified with water purification tablets (FRESH) or boiled.

For Canoeing:
a. Buy or use a plastic garbage bag as a waterproof container for supplies in a canoe. Lash it down.
b. Bring along a bailer made from a plastic bleach bottle and lash it to the thwart.
c. To deaden sound, put a piece of carpeting in the bottom.
d. A hunk of aluminum duct tape makes a fine temporary repair for holes in either aluminum or fiberglass canoes.
e. Bring along a bow and a stern line about ten feet long.
f. Call the Coast Guard to find out what life preservers must be carried on canoes.

For survival:
a. A survival pack should be carefully planned. Steel wool and batteries can be used to start a fire.
b. Aluminum foil can concentrate heat, wrap food, serve as a signal.
c. A piece of bright red chiffon could be a signal or a filter.
d. A red bandana keeps your neck warm, can be wrapped around your head or serve as a signal.
e. Wear an I.D. braclet or pendent if you have an allergy.
f. A space blanket takes up very little space and is effective.
g. Know which plants are edible and pick those only if you are absolutely sure of their identification.

BROWARD COUNTY PARKS



REFERENCE
OUTDOOR ACTIVITIES

There are many local organizations whose interests are an extension of the governmental programs involved in wildlife conservation. There is something of interest for everyone, whether active or passive.

The following references may provide information for your personal interest. These organizations have knowledgeable members who may provide worthwhile speakers or film services for the education of local groups, regarding the environment.

ARCHAEOLOGY

Broward County Archeological Society
2511 McKinley Street
Hollywood, Florida 33020
Wilma Williams Tel: 922-4957

BACKPACKING, CANOEING, CAMPING, HIKING, SURVIVAL

Florida Trail Association
P.O. Box 13703
Gainesville, Fla. 32604

The Palm Beach Pack and Paddle Club
or Pine Jog Environmental Sciences Center
6301 Summit Boulevard
West Palm Beach, Fla.
Jim Husky or Bob Bergen
Tel: 1-686-6600

Tom Robinson
(well-versed individual regarding survival)
5256 N.E. 3rd Terrace
Ft. Lauderdale, Fla. 33334
Tel: 776-0643

Sierra Club
Conservation and Education
Candee Henderson
4301 N.W. 37 Terrace
Lauderdale Lakes, Fla. 33309
Tel: 739-4067

REFERENCE
OUTDOOR ACTIVITIES

S.T.E.P (Students Toward Environmental Participation)
National Park Service, Southeast Region
3401 Whipple Avenue
Atlanta, Georgia 30344
Tel: 404-526-7652

BOATING AND FISHING

Ft. Lauderdale Outboard Club
Elgie Brown
3000 S.W. 26 Terrace
Ft. Lauderdale, Fla. 33312
Tel: 583-6615

Florida Department of Natural Resources
Crown Building
Tallahassee, Fla.

HUNTING

Broward County Airboat and Half-Track Club
295 N.W. 188 St.
Miami, Fla.
Tel: 1-652-5039
or call Lillian or Farmer Cooper
Tel: 989-2229

Broward County Shooting and Hunting Club
P.O. Box 14154
Ft. Lauderdale, Fla. 33302
or call Ralph "Sonny" Merritt
583-8604

Florida Game & Fresh Water Fish Commission
Education and Information Service
Lt. Robert Burleson
351 N. Military Trail
West Palm Beach, Fla. 33406
Tel: 1-800-432-2046
or the
Ft. Lauderdale Commission
3994 S.W. 12 Terrace
Ft. Lauderdale, Fla.
Tel: 524-3125

REFERENCE
OUTDOOR ACTIVITIES

Safari Club
Conservation & Education
David Charland
3503 N.W. 82 Drive
Coral Springs, Fla. 33065
Tel: 752-6121
or call Jack Beal, Tel: 523-2973

South Florida Water Management District
Shelia Middaugh
3301 Gun Club Road
P.O. Box V
West Palm Beach, Fla. 33402
Tel: 1-686-8800

NATURE STUDY

Broward County Audubon Society
Karsten Rist, President
341 E. Tropical Way
Plantation, Fla.
Tel: 584-8006

Broward County Parks and Recreation
950 N.W. 38 St.
Ft. Lauderdale, Fla.
Tel 765-5920
Gil McAdam or Don Stone
(weekly hikes in county parks on Friday and Saturday beginning at 9:00 a.m. from October to June)

PHOTOGRAPHY

Ft. Lauderdale Camera Club

PUBLICATIONS
OUTDOOR RECREATION

Birds of Loxahatchee
Refuge Manager
Loxahatchee National Wildlife Refuge
Route 1, Box 278
Delray Beach, Fla. 33444

Dictionary of Trees
Florida and Sub-Tropical
Fred Walden
Great Outdoors Publishing Co.
4747 28th St. North
St. Petersburg, Fla.

Ducks Unlimited
Florida State University, Library of Film
Tallahassee, Fla.
George Scott, Tel. 233-2025 (Miami)

Elementary Map and Compass Instructions
Silva Co.
2466 N S Road 39
Box 574, Dept. B
La Porte, Indiana 46350

Florida Naturalist
P.O. Drawer 7
Maitland, Fla. 32751

A Guide to Community Resources for Outdoor Activities
IEE Broward County
Call: 765-6367

Guide to Florida Canoe Trails
Fla. Dept. of Natural Resources
Crown Building
Tallahassee, Fla. 32304

A Guide to the Wilderness Waterway of the Everglades National Park
Wm. Truesdell
University of Miami Press
Coral Gables, Fla.

PUBLICATIONS
OUTDOOR RECREATION

"How to Travel Light"
Camp Trails
4111 W Clarendon Ave.
Phoenix, Ariz 85019

Introduction to Canoeing
Bradford Angier & Zack Taylor
Stack pole books
Cameron & Kelker Sts.
Harrisburg, Pa. 17105

Maps and Charts
Interior Department
"Types of Maps Published by Government Agencies"
U.S. Government Printing Office
Washington, D.C. 20402

Survival References
Lyon Map Co.
245 SE First St.
Miami, Fla. 33131
Tel. 371-0266

Tropical Trails
Interpretive Service
Dade Co. Parks & Recreation
50 S.W. 32 Road
Miami, Fla. 33129